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TENNESSEE:

ITS

Agricultural & Mineral Wealth,

WITH AN

APPENDIX;

SHOWING THE

EXTENT, VALUE AND ACCESSIBILITY OF ITS ORES, WITH ANALYSES OF THE SAME.

BY

J. B. KILLEBREW, A. M.,

Com'r of Agriculture, Statistics and Mines.

NASHVILLE:
TAVEL, EASTMAN & HOWELL, PRINTERS TO THE STATE.
1876.

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To His Excellency, Gov. Jas. D. Porter:

I herewith submit a collection of facts pertaining to Tennessee, which, at your suggestion, has been prepared for distribution at the Centennial Exhibition.

I have the honor to be,

Very respectfully,

Your obedient servant,

J. B. KILLEBREW,

Commissioner of Agriculture, Statistics and Mines.

June 15, 1876.

Entered according to Act of Congress, in the year 1876, by
J. B. KILLEBREW, Comm'r,
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PREFATORY.

The continued and increasing demand for some manual treating of the resources of Tennessee, from persons in every portion of this country and Europe, and the earnest requests from the Commissioners of the Centennial Exhibition, have prompted me to prepare the accompanying work. Some of it has been reprinted from the stereotyped plates of the Abridgement of the Resources of Tennessee, ordered by the Commissioners of Agriculture, but a great deal of valuable matter pertaining to our mineral wealth, the result of more recent investigations, has been added in an Appendix. In this Appendix may be found analyses of iron ores from every division of the State, besides a great deal of fresh information which has never been embraced in any previous report. Especial attention has been given to such information as relates to our iron deposits. The State of Tennessee is remarkably rich in its beds of coal, iron, marble, cement rock, water power, and building materials. Prominence has been given in this work to such facts as will lead to an investigation of the peculiar advantages the State offers for the production of iron. It is believed, and this belief is steadily gaining ground with every fresh development, that Tennessee will in time become the great centre of iron manufacture in the United States. The excellence and great variety of the iron ores, the abundance and cheapness of fuel, which consists of both stone-coal and wood for the manufacture of charcoal, the contiguity of these to navigable streams and railroads, the salubrity and excellence of the climate, the productiveness of the soils, and the consequent cheapness of living, assure no doubtful future to the State of Tennessee. As will be seen, there are in the State brown and red hematites, magnetite, specular, and fossil ore. All the forms of limonite, namely, compact, pipe, pot, needle or gothite, turgite, bog, shot, black-jack, honeycomb, plate, slag, crystalline; also black band, carbonate of iron—these, and many more of inferior importance, are found in some of the divisions of the State. By a proper admixture of these ores any variety of iron that the market may demand can be made.

Rich coal fields, lying in proximity to inexhaustible beds of iron, can be bought for a nominal sum, not one-tenth what such property is worth in Pennsylvania. Timber privileges can be had for five cents per cord, and as a cord of wood makes about twenty-five bushels of charcoal, less than thirty cents expended in timber will suffice for making a ton of iron.

As to the quality of Tennessee iron, there can be no question at this day. It has stood the severest tests. Long ago it was demonstrated that to ride upon a steamboat whose boilers were made of Tennessee

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iron amounted practically to a life insurance. It has no rival as a boiler plate. Its toughness of fibre is remarkable. When examined through a magnifying glass, the fibrous structure resembles a bundle of wires closely welded. Nor does it recrystallize readily by vibrations. The railroad bridges made of it and subjected to powerful vibrations, have given no signs of failure. Long ago it was subjected to a severe test at the Franklin Institute in Philadelphia and pronounced by competent judges to be equal in every particular to the best Swedish iron. Tennessee charcoal iron now takes the front rank for car wheels, and has proved superior to all other iron of America for the manufacture of sugar kettles.

The iron age has reached its noontide, and the age of steel is fast ascending the horizon. In any estimates for the future, it would be well to consider the changes that will, in all probability, occur in this particular. Railroads cannot afford to use rails made of iron costing half as much as rails made of steel, when the latter will last seven times as long. Nor can railroad carriages or railroad bridges be built of costly timber, when they may be constructed of steel, light, strong, and indestructible by fire, at a cost far less, in proportion to their durability and strength.

In the State of Tennessee there are large deposits of ore mixed with manganese, from which the best spiegeleisen is made, a fracture of which exhibits a brilliant silvery lustre of great beauty. These ores occur in Greene county, in Dickson and other counties, while extensive beds of manganese are found in many others. The ores in Greene county are singular in the fact that no flux is required in smelting them.

As to the purity of the iron ores of Tennessee, the analyses given of specimens from various portions of the State, which may be found near the close of this pamphlet, will indicate their superiority. The specimens analyzed were not selected because of their supposed purity, but with the view of getting the average quality of the ores from the various localities mentioned. In every case better and worse specimens could have been procured. The analyses made of the magnetite from Carter county, for instance, yielded about 64 per cent of metallic iron, while specimens could have been selected that would have gone above 70 per cent. The main object in having these analyses made is to arrive at practical results; to show what a well appointed and well managed furnace can do. In every case where the ores have been used in such a furnace, the yield has equalled and sometimes exceeded the results of the analyses.

To Prof. B. S. Burton of the East Tennessee University, I am indebted for nearly all the analyses given in the Appendix. His skill as an analyst is acknowledged throughout the country, and his determinations are the result of the most accurate and painstaking investigations. A few analyses have been made by Prof. Lupton of the Vanderbilt University, whose ability as a chemist is recognized by the scientific world.

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TENNESSEE:

ITS

AGRICULTURAL AND MINERAL WEALTH.

TENNESSEE IN GENERAL.

No portion of the American continent is blessed with more natural advantages than the State of Tennessee. Lying between latitude 35° and 36° 30′ north, and longitude 81° 37′ and 90° 28′ west from Greenwich, it occupies a portion of that belt in which originated the laws, religion, the civilization and refinement of the Western World. The greatest length of the State measured on a parallel of latitude is 432 miles, and its extreme width 109 miles. A line drawn from the north-eastern corner of Johnson to the south-western extremity of Shelby county would be near 500 miles in length. Its area has been estimated at 45,600 square miles, but more recent estimates make it but little more than 42,000 square miles, or 26,880,000 acres. It is bounded on the north by Kentucky and Virginia, on the south-east by North Carolina, on the south by Georgia, Alabama and Mississippi, and on the west by the Mississippi River, which separates it from Arkansas and Missouri. It touches eight States on its borders, a greater number than is touched by the boundaries of any other State in the Union except Missouri. It is unequalled in the number and excellence of its navigable rivers. The great Father of Waters washes its western boundary, and the placid Tennessee and beautiful Cumberland, with sources in other States, sweep in concentric semicircles through the fairest and most valuable portions of the State, furnishing cheap water transportation for the varied products of the soil and of the mine.

NATURAL DIVISIONS.

Tennessee has eight well defined natural divisions:

I. Rising on its south-eastern borders in great ridge-like masses and treeless domes is the huge Appalachian chain, the loftiest peaks of

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which attain an elevation of more than 6,600 feet above the sea, and upon whose brows and bald summits the flora of Canada and the climate of New England may be found. These mountains form one of the natural divisions of the State, and are called the Unakas. Many beautiful and fertile valleys and coves nestle amid this grand range of mountains; but aside from these, this division is of but limited agricultural importance. Its average elevation above the sea is 5,000 feet, and it has an area of 2,000 square miles.

II. Adjoining this on the west, and enclosed between the Unakas and the Cumberland Table-land, is the beautifully fluted Valley of East Tennessee. This valley, so called because of the relations it bears to the mountains on each side, is a succession of ridges and minor valleys running in almost unbroken lines from north-east to south-west. If one could sail over it at a moderate elevation, this division would resemble the tumultous waves of a stormy ocean that have been arrested and hardened into stony firmness; but viewed from the highest peaks of the Unakas, the ridges and valleys melt into a common plain. The innumerable valleys of this division make it, agriculturally, one of the most important in the State. The average elevation of this great valley is 1,000 feet above the sea, and it has an area of 9,200 square miles.

III. Next in order comes the Cumberland Table-land, a high elevated plateau, that rises in massive grandeur to an average elevation of 2,000 feet above the sea, and 1,000 feet above the Valley of East Tennessee. The highest summits reach 3,500 feet above tide-water. Buried in the bosom of this plateau are huge treasures of coal and iron. On its eastern edge it forms almost a continuous line running in a north-easterly direction, and rises with an abruptness that is marked and striking, presenting a formidable, gray, rocky, cliff-lined rampart. The western edge is irregular and jagged, notched and scalloped by deep coves and valleys, which are separated by finger-like spurs pointing for the most part to the north-west. The soil of this division is sandy, thin, porous and unproductive, and it is of but little agricultural importance. Its area is 5,100 square miles.

IV. Resting against the western edge of the Cumberland Table-land and extending to the Tennessee River, with an average elevation of 1,000 feet above the sea, are the Highlands, Rimlands or Terrace-lands. This division is diversified in places with rolling hills and wide valleys. For the most part, however, it is a flat plain, furrowed by numerous ravines and traversed by frequent streams. The soil of this division is of varying fertility, but altogether it is a region of great agricultural importance and wealth. Its area is 9,300 square miles.

V. In the center of these Highlands, and surrounded by them, is the great Central Basin, elliptical in shape, and resembling the bed of a drained lake. It may be compared to the bottom of an oval dish, of which the Highlands form the broad, flat rim. The soil of this basin is highly productive of all the crops suited to the latitude, and it has been well named the Garden of Tennessee. In this basin stands the

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capital of the State. It is of the first importance as an agricultural region. Its area is 5,450 square miles, and it has an average depression of 300 feet below the Highlands. This whole basin, with the surrounding Highlands, is slightly tilted towards the north-west, and has a less elevation on that side than on any other.

VI. The Western Valley, or the Valley of the Tennessee, forms the next natural division. This is comparatively a narrow valley, with spurs from the Highlands pointing in towards it, and sometimes running down to the margin of the Tennessee River. The surface is broken and irregular. The soil is fertile, but marshy spots, covered with cypress forests, occur in places along the river. The main valley sends out various subordinate ones, extending sometimes as far as twenty or twenty-five miles before they are lost in the Highlands. The Western Valley is not considered as including all the territory drained by the tributaries of the Tennessee, but "its general limits are the lines along which the Highlands on both sides for the most part break away." The average width of this valley is ten or twelve miles, and its length the breadth of the State. It has an area of 1,200 square miles, and an elevation of 350 feet above the sea.

VII. The Plateau or Slope of West Tennessee is the seventh natural division, and is peculiar in having but few rocks, differing in this particular from all the divisions mentioned above. It is a great plain, that slopes gradually towards the Mississippi River, gently undulating, and differing widely in the character of its soil and scenery. Here the streams are sluggish, and their banks unstable. Furrowed with river valleys, this division extends for an average distance of about eighty-four miles, when "it abrubtly terminates, falling off into a long and steep bluff or escarpment, that overlooks the great alluvial low plain or bottoms of the Mississippi." The soil of this division is light, porous, siliceous, and charged with the elements of an abounding fertility. Its superficial extent is about 8,850 square miles, with an average elevation of five hundred feet.

VIII. The Bottoms of the Mississippi form the eighth and last natural division, and constitute a low, flat, alluvial plain, teeming with a rank luxuriance of vegetable life that is almost tropical. Lakes and morasses are frequent. The soil is of exuberant fertility, and will produce year after year, with no apparent diminution in quantity, enormous crops of corn and cotton. Its agricultural resources are immense, and when reclaimed from the dank, dark forests, will subsist a larger population than any other portion of the State in proportion to its area. The surface embraces 900 square miles, and it has an average elevation of 295 feet above the Gulf of Mexico.

CIVIL DIVISIONS.

There are three recognized civil or political divisions of the State:

I. *East Tennessee.* Comprising all the territory from the North Carolina line to about the center of the Cumberland Table-land, in-

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cluding the first and second natural divisions and about half of the third, and embracing the following counties:

Anderson, Bledsoe, Blount, Bradley, Campbell, Carter, Claiborne, Cocke, Grainger, Greene, Hamblen, Hamilton, Hancock, Hawkins, James, Jefferson, Johnson, Knox, Loudon, McMinn, Marion, Meigs, Monroe, Morgan, Polk, Rhea, Roane, Scott, Sequatchie, Sevier, Sullivan, Union, Washington.

II. *Middle Tennessee.* Extending from the dividing line on the Cumberland Table-land to the Tennessee River, and comprising the whole of the fourth and fifth natural divisions and about half of the third and sixth. It embraces the following counties:

Bedford, Cannon, Clay, Cheatham, Coffee, Cumberland, Davidson, Dickson, DeKalb, Fentress, Franklin, Giles, Grundy, Humphreys, Hickman, Houston, Jackson, Lawrence, Lewis, Lincoln, Macon, Marshall, Maury, Montgomery, Moore, Overton Perry, Putnam, Robertson, Rutherford, Smith, Stewart, Sumner, Trousdale, Van Buren, Warren, Wayne, White, Williamson, Wilson.

III. *West Tennessee.* Extending from the Tennessee River to the Mississippi, and including the whole of the seventh and eighth natural divisions and half the sixth. The following counties are included in this division:

Benton, Carroll, Crockett, Decatur, Dyer, Fayette, Gibson, Hardeman, Hardin, Haywood, Henderson, Henry, Lake, Lauderdale, Madison, McNairy, Obion, Shelby, Tipton, Weakley.

CLIMATE.

The most happy combination of climate appears to be that in which the amount of humidity and sunshine is just sufficient to produce the highest degree of perfection and maturity in the crops, and where the degree of cold is just enough to invigorate the physical system, ameliorate the soil, and destroy the germs of disabling disease. Such a combination is to be met with in by far the larger portion of the State of Tennessee. Healthy breezes, by reason of elevation, sweep over the State and dispel the noxious exhalations of the soil. The atmosphere is kept in purity by motion, as the waters of a stream. The miasmata which arise from low spots, charged with disease and death, are dissipated almost as fast as formed. The malarious districts of the State are very small. The days of rain and sunshine, of heat and cold, are beautifully ordered. Health is the rule, sickness the exception. Visitors often wonder at the large number of healthy old men, active, strong and vigorous. No State can boast of greater health, with greater advantages of soil and climate, and at the same time such a variety of crops, that are grown to perfection. The hills, the knobs, the mountains, the intervenient coves and valleys, give great diversity of sub-climate. Tennessee has indeed a double climate—one resulting from latitude, and the other from elevation—so interwoven and modified by varieties of soil, position, exposure, trend of mountain ranges,

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etc., that the characteristics of the climate of every State from Mississippi to Canada may be found in it. The deliciousness of the climate in spring and autumn is unsurpassed by that of Italy. The glory of our Indian summer, when the whole physical nature, attuned to the surrounding influences, exults in an abounding and jubilant vitality, has been a fruitful theme for the poet and philosopher. At that season, which usually occurs in November, the softened tints of the landscape, beautified by the blended colors of decaying leaves, are charming and ravishing to the eye. An agreeable haziness pervades the atmosphere, which attempers the rays of the sun, destroying the glare without lessening the brightness. It is the most delightful season of the year. Spring resembles it in all save the haziness of the atmosphere and the bright colors of the decaying leaves of the forests.

The mean temperature of the year in the Valley of East Tennessee is 57° Farenheit; in Middle Tennessee 58°; in West Tennessee 59°. The mean annual temperature of Tennessee is the same as that of some of the most delightful regions of the globe. Its isothermals pass through North Carolina, the northern part of Spain, touch the south of France, traverse the vine-clad hills of Italy and the classic land of Greece, through fig-growing Smyrna, crossing the Caspian Sea near its southern extremity, through the great tea-growing districts of China, and through the spicy fields of the Japan Islands, re-entering the United States near San Francisco. Though upon the same isothermals there is a marked difference between the climate of Tennessee and that of the European States mentioned. The range of the thermometer is not so great in the latter. Our summers are hotter but not so long continued, and our winters are colder. The orange, the olive and the lemon, that flourish upon the shores of the Mediterranean, do not mature in our climate. The fig ripens in some favored localities. But for the production of those plants that require a high degree of heat, it far surpasses the countries of the same isothermals in Europe. Indian corn, melons, annual vines, grow with amazing rapidity upon fertile soils. Under the more favorable conditions, corn will grow three inches in a single night, and the melon and grape-vine almost as much. European grapes rarely do well with us. Attempts to acclimate the Malaga grape-vine have proved unsatisfactory. The native varieties of grapes, however, are brought to a high degree of perfection. The amount of annual rainfall in Turin is 36 inches, while the annual temperature is 53°. In the Maderia wine-growing districts the rainfall is 30 inches and the average temperature 67°—winter averaging 61° and summer 71°—showing an average range of only 10°. Our annual mean temperature is about 58°; rainfall, 46 inches; and range of thermometer, when summer and winter averages are compared, about 45°

The mean temperature of winter in Knoxville is 38°.66; of summer 74°.02. Knoxville has about the same summer temperature of Philadelphia, Cincinnati, and Louisville. It is that of the central part of Spain and northern part of Italy.

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The mean temperature of the Central Basin in which Nashville is situated, is 75°.

West Tennessee has summer means higher by about a degree than those of the Central Basin. The differences are sufficient to lengthen the growing season, and to so modify the climate as to throw a large part of this division into the cotton-growing region.

The average winter temperature of the middle parallel of the State may be placed at about 38°, and it is doubtless nearly the same in East, Middle and West Tennessee.

In Middle Tennessee January is the coldest month, 34°.08 being the mean of this month for 21 years; then follows December, its mean being 38°.54; then February, 41°, and then the remaining months in order as follows: November, 46°.45; March, 47°.30; October, 57°.16; April, 57°.84; May, 64°.98; September, 69°; June, 72°.14; August, 74°.85; July, 76°.22, which, as the hottest month, terminates the climax.

The temperature of the Cumberland Table-land is from four to five degrees lower than that of points on the same parallel in the Central Basin, and from two to three lower than corresponding points in the Valley of East Tennessee. The difference in temperature is most apparent at night.

Through a period of twenty-two years the thermometer has never in Montgomery county (where the only systematic observations have been made for such a long period) reached 100° but once, and that was in 1874. During the same period the temperature has fallen below zero seven times, the lowest being minus 8 in January, 1857, and 1864, respectively.

The average length of the growing season for twenty-two years in Middle Tennessee, or rather the number of days between killing frosts, is 189. The shortest growing season was in 1872, when it was only 162 days. The longest was in 1852, which extended from March 23, to November 8, and embraced 228 days. In the southern portion of the State the period of no frost is from twelve days to two weeks longer. The average mean rainfall in Middle Tennessee is 45.715 inches. The greatest rainfall for any one year was in 1865, and amounted to 60 inches; the least was in 1853, and amounted to nearly 37 inches.

There are but few States which have a more healthful climate than Tennessee. The percentage of deaths to the whole population of the United States was, for the census year beginning 1st of June, 1869, and ending May 31, 1870, 1.28. In Tennessee it was 1.13. There are twenty-four States and Territories in which the percentage was greater than in Tennessee, and twenty-two in which it was less. But it is a noticeable fact, that those States or Territories which were reported as most healthy were those which were being settled, and the proportion of children small. The proportion of deaths in the United States under five years of age to the whole number of deaths, is 41.2 per cent. This proportion in Tennessee is less, being about 39 per cent. By leaving out those States and Territoties which are being set-

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tled, it will be found that Tennessee ranks in the list of the healthiest States in the Union.

SOILS.

Every variety of soil may be found within the limits of the State of Tennessee. On the Unakas are found soils derived from the disintegration of granite, which are sandy, micaceous and mellow. These granitic soils are confined exclusively to the counties bordering the eastern boundary of the State. Owing to the uneven surface of this portion of the State the capacity of these soils for field crops has been tested to a small extent. Wild grasses grow upon the tops of the mountains with great luxuriance, and afford fine pasture grounds for stock herders. The soil upon some of the balds is black and prairie-like. Buckwheat grows with great rankness, and yields with remarkable fecundity.

On the Cumberland Table-land sandstone soils prevail, as well as on some of the ridges in the Valley of East Tennessee.

This class of soils may be divided into five kinds, more or less distinct. These are the Chilhowee Sandstone, Knox Sandstone, Clinch Mountain Sandstone, White Oak Mountain and Dyestone Rocks, and Cumberland Mountain Sandstone.

1. *The Chilhowee Sandstone Soil* is confined to the mountain ridges, and is very limited in extent. Some few areas are found that will repay the labors of the husbandman in the cultivation of potatoes, buckwheat and garden vegetables. The Chilhowee Mountains, which pass through Blount county and a portion of Sevier, are sparsely settled, and but a small proportion of the soil has ever been cultivated, but it is much used as a common pasture ground—blue-grass growing luxuriantly upon some of the ridges near the Virginia line in the counties of Johnson and Carter. This soil prevails also upon all the northwestwardly interrupted range of the Unakas.

It may be well to observe that the Unakas are a double range of mountains; that on the southeast side being continuous, and the range on the northwestern side being broken or interrupted.

2. *The Knox Sandstone Soil* is unimportant, being confined to long, narrow, sharp ridges, which are often called Piney or Comby ridges. This soil is confined to the Valley of East Tennessee, and is very little cultivated. It produces timber in limited quantities but not much grass, and is not so valuable for pasture grounds as the preceding.

3. *The Clinch Mountain Sandstone Soil* occurs mostly on the southeast side of Clinch Mountain, which traverses Grainger, Hancock and Hawkins counties; on Powell's Mountain, which lies in Claiborne and Hancock counties; on Lone Mountain, a continuation of the latter, in the counties of Anderson and Union, and on some of the ridges of the Bays Mountain group, which lies mostly in Hawkins county. It is thin, sandy and poor, sparsely timbered, and has immediately underlying it large sheets of sandstone. It has a pale yellowish color, and when the depth of the soil is sufficient, will yield Irish potatoes and

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garden vegetables. It may be mentioned that the north-west sides of these mountains have a very fertile and calcareous soil, highly productive, the fields in many cases reaching the crests of the mountains. It is curious to observe the exuberance of vegetable growth on the one side and the poverty on the other. Stately trees with leafy tops, covered with vines and creepers, making an impenetrable thicket, characterize the one side in its wild state, while the other, covered with an impenetrable shield of sandstone, has here and there a few scanty shrubs and starveling trees, typifying the indescribable sterility and scantiness of the soil.

4. *The White Oak Mountain and Dyestone Soil* occurs on the south-east side of White Oak Mountain in James and Bradley counties, and on the slopes of the smaller Dyestone ridges. These ridges are so called from the occurrence of red and stratified iron ore. The rocks underlying this variety of sandstone soils are more varied in chemical composition and give more vitality and fertility to the soil, which are manifested in the better growth of timber, though but small areas of this variety have been brought into cultivation, owing to the ruggedness of the country in which it prevails. It may be added that the aggregate extent of this soil is very limited, and could only be represented by mere lines on the Map. The White Oak Mountain and the ridges mentioned are interesting mainly on account of the abundance of iron ore.

5. *The Cumberland Mountain Soil* is the most important of this group, inasmuch as it extends over an area of about 5,000 square miles, covering nearly the whole surface on the top of the Cumberland Table-land. This soil is sandy and thin, the sand being course and angular. Nevertheless, at the foot of some of the knobs and ridges that rise above the general level of the table-land, there are areas of moderate fertility. The valleys, too, upon the top of the plateau and the north hill-sides are much above the average in fertility. This region is totally destitute of lime, extremely porous, and difficult to improve.

There are so many contradictory statements in regard to the fruitfulness of this soil, that it is hard to give an opinion that will be concurred in by every one. There are two leading classes of soils on the table-land, the most valuable of which has a yellowish red sub-soil, with a thin coating of humus on the surface. This character of land can be improved and rendered highly productive, but continual vigilance and care are required to prevent the escape of the elements of fertility. This may be effected by seeding to clover, which should be treated to frequent and liberal top-dressings of plaster of Paris. The soil is extremely tender, and constant care is required to prevent washing. For the production of all kinds of fruits, including grapes, root crops and garden vegetables, this land is scarcely surpassed. The finest Irish potatoes grown in the South are raised on this table-land. Apples, pears, and peaches are very prolific, and the trees are thrifty and long-lived. It is the orchard-land of the State, and millions of barrels of the very best apples could be grown annually at a small

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cost. The high elevation secures the fruit from untimely frosts, and the dry atmosphere prevents a premature decay. For the growing of potatoes and fruits no land is superior to it, but for the cereals it is uncertain, and unproductive. Nevertheless some excellent crops have been made, and the Swiss who have settled upon this mountain-land are growing clover and the grasses with some degree of success. The lands are cheap, the climate healthful, the timber and water abundant, and the highway pasturage excellent.

The second class of these soils has a light-yellow, whitish and sometimes bluish sub-soil, with little or no humus. It is extremely porous, leaky and, when wet, is often inclined to be miry. In its native state it produces nothing but shrubby trees and a scanty growth of hardy weeds and coarse grass. Much of the surface is covered with lichens and sometimes with mosses. Manure applied to these lands soon disappears, leaving scarcely a trace after the first or second season. It is a serious question to determine the best uses of which these lands are capable. For grain-farming they are valueless, and scarcely better for fruits and cultivated grasses. The native grasses and herbs, with such of the hardy cultivated kinds as might be induced to grow upon them, would afford pasturage sufficient during the summer for sheep and goats, and perhaps for cattle.

Besides these two leading classes of soils pertaining to the table-land, there is another, more limited in extent, but possessing peculiar characteristics which entitle it to special consideration. This class comprehends the glades and wet lands along the smaller streams. The soil, when wet, is of a dark-blue color, sometimes nearly black, but when dried it is ash-colored. Blue clay is generally found in connection with it as a substratum. These soils are often entirely destitute of timber, and covered with coarse, rank grass, and spotted with beds of fern, the tussocks of which form a close mat over the surface. The absence of timber is owing to the superabundance of water with which the ground is saturated throughout the greater part of the year. These lands present another problem, but we are more hopeful of them than of the class of uplands last described. It is true that many efforts to reclaim them have failed, but this is owing to a failure to understand their peculiar character. It is not enough to drain off the water. They contain large quantities of half decomposed vegetable matter, which imparts to them a high degree of acidity, and this must be corrected by a liberal use of alkali, and for this purpose either wood ashes or lime may be used. When thus treated, they are nearly equal to alluvial soils in fertility, and are especially valuable for meadows.

We insert the following letter from Col. Moffat who has had much experience in the cultivation of Cumberland Mountain soils.

NASHVILLE, TENN., Oct. 5, 1874.

J. B. Killebrew, Esq., Secretary of Bureau of Agriculture:

DEAR SIR—In reply to your favor asking my opinion of the plateau lands of the Cumberland Mountains, I will endeavor to give you, in as few words as possible, my estimate of them, based upon practical experience and close observation for four years.

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And first, let me say that, compared with the rich alluvial soils of the Central Basin, these lands are poor, and the farmer who attempts to farm them in the same way that he does the lowlands, and depends upon a corn crop, will most certainly fail. And yet I consider they have advantages which render them, under intelligent treatment, the most desirable and intrinsically valuable lands in our State, for the following reasons:

1. The soil, though thin, is lively, easily cultivated, and responds with a generous vitality to fertilizers that I have not seen equalled anywhere else.

2. As a grazing country it has no superior, the natural grasses which cover the whole plateau affording abundant pasture for seven months in the year. Everywhere there is abundance of clear, cold, freestone water, and the elevation renders the climate so delightfully cool, and free from flies, that cattle do better here than anywhere else in the State, while proper effort will secure an abundance of winter food. All the following grasses and cereals can be cultivated with success: clover, herds-grass and orchard-grass (I have not yet sufficiently tested timothy to speak with certainty of it); rye and peas do well, and wheat, I think, will do well. I have only made one trial of the latter; my yield was fifteen bushels per acre.

I consider this territory the best in our State for sheep-raising.

But my third and strongest reason for my appreciation of the plateau is the fact that its elevation adapts it specially for raising those products which the South cannot raise in its lowlands in the same perfection; and thus, as the farmer raises northern products in the midst of a southern market, his profits are great.

The average yield of Irish potatoes here is one hundred bushels per acre, and these of a quality equaling those of New York or Michigan. Cabbage is another product largely imported into the South, and these also can be raised with success. But the great product of the plateau is the winter apple. We have made a careful investigation of apple culture on the plateau, extending over several counties, and we have no hesitation in saying that an orchard in full bearing, producing the winter apple, will pay 10 per cent. per annum, on from $500 to $1,000 an acre.

I have made the above estimate upon actual results which have come under my own observation. To sum up, I would say that I would not recommend the plateau lands to the immigrant who is very poor, and who requires immediate returns for his labor. Such a one could do better by renting some of the rich land already in cultivation, of which there is an abundance in our State. But to the man of moderate capital and enterprise, who can afford to clear up his land, engage in stock-raising, making of butter and cheese, sheep-raising and fruit-growing, we know of no section where he could make a more profitable investment, and at the same time have such a delightful climate, noted for its pure water, fine atmosphere, and exemption from all malarial diseases.

Yours truly,

JOHN MOFFAT,

Commissioner of Immigration for Middle Tennessee.

P. S.—Grape culture has also been fully tested, and succeeds admirably.

The flinty or siliceous soil, found in greatest abundance on the Highland Rim, and most especially in the counties of Lawrence, Wayne, Lewis, in less quantities in Stewart, Montgomery, DeKalb, Cannon, Coffee, Moore, Hickman, Humphreys, Dickson and Franklin, is thin, poor and hungry. It has an original poverty of constitution. It generally rests upon a bluish or pale yellowish sub-soil, so porous as to render the effects of manure unobservable after one or two years. Chestnut, sweet-gum, black-jack, and water-oak, with an undergrowth of greenbriers, huckleberry and barberry, are the characteristic growth. It also produces, in open woods, a coarse, rank grass, which, when young and tender, is palatable to "stock." Thousands of cattle and sheep are subsisted upon these highland pastures, and this "barren land" is chiefly valuable for that purpose in an agricultural point of view. Notwithstanding the sterility of this soil, it has been found well adapted to the growth of almost all the varieties of fruit trees. Orchards that have been standing for over half a century, are still boun-

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teous in their yield of fruit. The finest specimens of the apple tree in the State are found upon such lands in the counties of Lawrence and Wayne. The trees are rarely attacked by disease or insects; and peach trees, planted forty years ago, are still vigorous in their growth and prolific in their yield. The borer and curculio are unknown, and the porosity of the soil enables the roots of trees to take a wide range in search of nourishment. These "barren lands" are usually very level and thinly wooded, and present to the eye a beautiful surface. Many settlements have from time to time been made upon this character of soil, but are quickly abandoned, leaving sightless, "broomsedge" fields and a few fruit trees as the only trace of their former occupancy. It would be unjust to those seeking homes in our State to conceal the fact that this character of soil is unfit for general farming purposes, and whoever relies upon it for the growing of the ordinary crops must remain steeped in poverty and destitution. When the country shall have become more densely populated and great cities shall be accessible, these "barrens" will become valuable as a fruit region, and will have the capacity of supplying millions of barrels of apples and bushels of peaches at cheap rates. They also may be valuable as summer homes, for their high elevation gives them invigorating breezes, and the water is as clear as light and pure as that distilled by the clouds.

Associated with this flinty soil oftentimes is a chocolate-colored soil resting upon red clay. This is always fertile and should not be confounded with soil resting upon a pale, porous clay. Spots of this character are found in all the counties named above, and wherever found is sure to be productive. It is classed with the calcareous soils.

Sandy Soils. Under this head are included the varieties of mellow upland and highland soils which occur in West Tennessee. They are based, not on solid rock, like the sandstone soils mentioned, but upon unconsolidated strata of matter mainly sandy. The soils resulting are mainly of the same character. They are called sandy or arenaceous, because this mineral feature greatly predominates, and are generally red or yellow, from the presence of a notable quantity of ferric oxide and silicate. It does not follow that because a soil is "sandy" it is therefore poor. The clay and calcareous matter that some contain give them a degree of body and vitality which make them for many crops highly valuable lands. The way they lie, too, is an important consideration. If high, plateau-like, or gently rolling and well drained, such lands are often highly esteemed by the farmer; when, if steep or very hilly, they are not prized. In the latter case the soils have the same components, but, under tillage, are easily washed and made comparatively worthless.

The *Calcareo-siliceous* soil occupies the eastern parts of the counties of Obion, Dyer, Lauderdale, Tipton and Shelby. It presents an ashen aspect as to color and consistence, but sometimes it is of a reddish cast, occasionally black and oftentimes mulatto in color. It contains more calcareous matter than the other unconsolidated formations of West Tennessee, with the single exception of the Green Sand or Rotten Lime-

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stone. It is not unusual to meet imbedded in it concretions of carbonate of lime. At some points they may be gathered by the bushel. The soil is similar in character to the formation—calcareous, siliceous, or fine grained, ashen, and sometimes slightly reddish and black earth. Its lands are among the most fertile in the State. The soil owes its good qualities, not to its chemical composition alone, but also to its finely pulverulent mechanical condition. Tobacco, cotton, wheat, oats, clover and the grasses grow luxuriantly upon it, while the native growth, especially in Obion and Dyer, is of marvellous exuberance.

Calcareous Soils. These rest upon the different varieties of limestone found in the State, and differ mainly in having a greater or less quantity of siliceous material or clay in their composition, making them friable or stiff as one or the other ingredient preponderates. In durability, productiveness and extent, they surpass all other soils in the State, with the exception of the alluvial. They constitute the wheat, tobacco, blue-grass, and much of the cotton lands of the State, and are found in all the minor valleys of the Valley of East Tennessee, in the Central Basin, on much of the Highland Rim, and in the Western Valley. But little of these soils are found in West Tennessee. These soils are classified according to the character of the prevailing limestone, and form the best farming areas of the State. They cover in the aggregate one-fourth of the surface of the State.

Green Sand Soil. This soil is a kind of siliceous loam, resting upon an interesting formation in West Tennessee, which is, in the main, sand and clay intermixed, having as characteristic ingredients a considerable amount of carbonate of lime and numerous green grains (*glauconite*) resembling in consistence particles of gunpowder, which give the mass a light greenish color. It must be mentioned that the formation from which this soil is derived is loaded with shells, so much so that they furnish material for burning lime. This greatly influences the character of the soil, supplying it with fertile ingredients and making it friable and productive. It is well adapted to the growth of cotton and corn, and some portions to the growth of wheat. The land where this soil prevails is by far the most rugged portion of West Tennessee, and many glady spots occur, especially upon the Tennessee Ridge, west, and its various spurs. This soil is confined almost entirely to the eastern part of McNairy and Henderson counties.

Shaly Soil. Shales are common in many parts of the State. *The Black Shale* underlies the lands of the rim, sometimes, however, cropping out; other shales are found in great abundance associated with the coal strata in the Cumberland Table-land; but as a top formation shale is rare. In a few of the narrow valleys of East Tennessee the *Black Shale* forms the basis of the soil. This soil is cold, clayey, unimportant and unproductive, except for the grasses. In extent it is very limited, and it may be improved by utilizing the accompanying beds of calcareous nodules, some of which are nearly pure phosphates.

Alluvial Soil. This soil, in the aggregate, occupies a larger area than any other in the State; for, to the 900 square miles embraced

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by the great Mississippi bottoms, there must be added the lowlands of the Tennessee and the Cumberland rivers and that of all their tributaries. Alluvial soils also prevail in the valleys of East Tennessee. The whole State is furrowed by rivers, creeks, and rills, each of which has lying upon its margin more or less alluvial soil. Some of the highland counties, as Perry, are alternate ridges and valleys. The alluvial soils differ greatly in character, aptitudes and productive capacity, depending in great degree upon the formations of the surrounding highlands and upon the frequency or infrequency of the overflows. Where the water-courses flow through or over limestone formations the sediments which they deposit is highly calcareous. When the streams gather their waters from gravelly hills or sandstone ridges the soil is more deficient in carbonate of lime and usually not so productive. The character of the alluvial soil is generally determined by the region through which the stream flows. On many of the streams are terraces, elevated high above the stream-beds and not subject to overflow, which have all the characteristic features of the low alluvial soils. There are places of this kind on the Cumberland, and especially on Red River, a tributary of the Cumberland, which are composed of sand, gravel and loam, such as might be deposited by the river if dammed up. These fluviatile deposits are exceedingly rich in plant food, and make our most generous soils. Their perfect drainage and freedom from overflows make them very valuable and desirable. For the growth of wheat they are especially adapted. We have seen as much as forty bushels of this cereal raised upon an acre of such elevated alluvial soil.

The streams on the Highland Rim have their lowlands highly charged with flinty material. The soil is free and comparatively light, being formed, for the most part, of the silt deposited from the waters, intermingled with chert and fragments of shivered limestone. Upon this character of soil are grown in great abundance peanuts, corn and potatoes. It never compacts, but remains loose and friable throughout the growing season. Though not so productive of timothy as the more clayey bottoms, this rocky alluvium is more highly esteemed for all the crops that require cultivation.

The alluvium of the Mississippi forms by far the largest area of this soil, and differs in some degree from that on the other rivers and streams of the State. The Mississippi river flows upon the top of a ridge, the margins of the stream being higher than the country a short distance back. Immediately upon the banks and running back for half a mile or more the soil is fine, sandy, yet sufficiently argillaceous, impregnated with vegetable matter, mellow and rich. Back of this, low, marshy strips occur where the lands have not been brought into cultivation to any extent. Beyond these marshes the dry alluvium again appears, and extends out in places for many miles. This is the most productive region in the State, but being low and flat the situation is liable to malarious influences, and is therefore not considered desirable for homes. The soil is black, and has an undetermined

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depth and is totally inexhaustible. There are almost an infinite variety and modification of these classes, making warm and cold, light and heavy, low, loamy, marly, hungry, leachy, limy, sweet, sour, sandy, clayey, marshy, compact, tenacious, fine, coarse, gravelly, rocky, "crawfishy"; but all may be embraced in the classification given above.

TIMBER.

The Agricultural Department at Washington, estimating the number of square miles in the State at 45,600, gives 15,572,789 acres as the amount of timber. But as the area of the State is only 42,000 square miles, or 26,880,000 acres, there must be deducted from the above 2,304,000 acres, leaving of timbered or wooded land 13,268,789 acres, or not quite fifty per cent. of the whole. The States having the same proportion of timber are Florida, Arkansas and West Virginia; the States having a larger percentage are North Carolina, South Carolina and Georgia. All the remaining States have a less percentage of their lands in timber.

Nearly every variety of timber found in the United States grows in the State of Tennessee. This is due, in a great measure, to the difference of elevation which may be found in the State, which in effect gives a great diversity of climate. The alluvial bottoms of the Mississippi river are 220 feet above the level of the sea, while the highest peaks of the Unakas rise in grand sublimity more than 6,600 feet. It is due in part also to the existence of a great variety of soil. The magnificence of the forests in some portions of West Tennessee is unsurpassed in the United States. The rich soil, stimulated into an amazing activity by hot suns and a prevailing humidity, is covered with a vegetation of incredible profusion. The poplar, the sassafras and oak, revelling in the exhuberant fertility of the earth, attain a size second only to the giant redwoods of California.

The *White Ash* is found all over the Central Basin, in the coves and north sides of the mountains and on the rich soils of West Tennessee. The largest trees we have met with are in Bedford county. The green ash is not so common, and is only met with along water-courses.

The *Beech* is a common growth throughout the State, upon the moist soils lying upon the streams. The most extensive groves are found in Macon, Trousdale, Smith, Cannon, Bedford, Maury, and other counties in the Central Basin.

The *Birch* tree is found upon Clinch river in considerable quantities.

The *Buckeye* grows upon the rich soils in many parts of the State, and most especially in the mountainous and knobby districts, where it grows to the height of sixty or seventy feet, and three feet in diameter. It also grows upon the river-courses.

The *Red Cedar* is considered among the most valuable of all the woods. Formerly it was very abundant in the Central Basin, growing for the most part in belts or strips upon the glady limestone. The soil and climate of this region seem peculiarly favorable to its growth and

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to the perfection of its wood. Upon the first settlement of the State, cedar forests were as abundant in the Central Basin as those of oak and poplar. The demands, however, of the agriculturists, combined with the export demand, have nearly exhausted the supply in Davidson, Williamson, Sumner and Rutherford. The best forests are now found in Marshall, Wilson, Bedford and Maury, covering in the aggregate 300 square miles. Occasional trees of a valuable size are still seen upon the banks of a majority of the streams in Middle Tennessee. Nowhere in the United States are there found such splendid trees of this timber. In the counties of Marshall and Bedford solid cedar logs have been cut that would square twenty-four inches for a distance of thirty feet.

Chestnut. Large forests of this timber are found on the ridges of East Tennessee, on the sandstone soils of the Cumberland Table-land, and in portions of the Highland Rim, especially in the counties of Lawrence, Wayne, Hickman and Perry.

The *Wild Cherry* is found in every part of the State, but not in groves. The trees are scattered thinly on rich soils.

Cotton Wood is confined almost exclusively to West Tennessee, and more particularly to that portion of West Tennessee that constitutes the alluvial bottoms of the Mississippi. It grows to an immense size, towering high in the air and darkening the landscape with its thick foliage.

Cypress. In the swamps lying on the Mississippi and Tennessee rivers the cypress finds its most congenial home, and attains its highest development. It exists upon these rivers in considerable abundance. Owing to its peculiar nature it rarely grows in company with other trees, but stands in isolated forests, rearing its long white trunk high into the upper air, while its roots permeate the deep black soil, which is often covered with water of an inky blackness.

Dogwood and *Elm* are found all over the rich soils of the State, but the wood is not prized.

Firs. Some of the highest mountain peaks are covered with the Balsam Firs, and they are seldom met with at a lower elevation than 4,000 feet. The dark, sombre, dusky foliage of this tree has given the name to the Black Mountains of North Carolina, and makes the characteristic feature of many of the highest peaks of the Unakas. Being inaccessible, it is rarely made into lumber, though the trunks often rise 100 feet in height. It is distinguised by a balsam which gathers in blister-like intumesences in its bark, and gives the name to the tree. The Black Fir is also met with in the same localities.

Gum. Two very different species of trees are commonly called gum; both are quite abundant in Tennessee. The Black Gum (*Nyssa Aquatica*) is usually found upon rich, moist soils, and grows to a considerable size where the soil is favorable to its growth. It is a valuable timber for hubs, and is much used for that purpose on account of the difficulty with which it splits.

The *Sweet Gum* (*Liquidamber Styraciflua*) finds its most congenial

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home in wet, marshy places. It is found in every part of the State in such situations. Large quantities of it are manufactured into plank, which is used for coarse work. It is cheaper than poplar, and decays much more rapidly.

Hickory of different species is found in great quantities in every division of the State.

The *Linn or Basswood* is abundant in the blue-grass region of the Central Basin.

Black or Yellow Locust flourishes upon the slopes of the Highlands, upon the Cumberland Table-land and upon the sides of the Unakas.

Honey Locust is found in company with the walnut, elm, scaly-bark hickory, hornbeam, ash, &c., upon all the rich soils of the State.

Sugar Maple abounds in the coves of the mountains and on alluvial bottoms. It formerly covered a large portion of the Central Basin. The Red Flowering Maple grows on wet soils and on the marshy margins of streams.

Red Mulberry. The rich soils in every part of the State are productive of this tree.

Oaks. Almost every species of this tree is found within the State. In the Valley of the Tennessee, especially in the counties of Hardin, Wayne, Perry, Humphreys, Houston and Stewart, and in the first and second tiers of counties in West Tennessee on the Mississippi river, the white oak grows to an enormous size. In East Tennessee, on the ridges in the western part of that division of the State, and on the Unaka Mountains, this tree attains great dimensions. The ridges and valleys lying on Duck and Buffalo rivers are clothed with forests of white oak. More than 1,600,000 staves made of white oak are annually shipped out of Tennessee river. The red oak, post oak, black oak and chestnut oak are found in large quantities in every portion of the State. The scarlet oak is found in the small swampy spots in Middle and West Tennessee. Black-jack oak is the principal growth in the flat lands of Coffee, Lawrence, Wayne, Lewis, Humphreys, Dickson and Hickman counties.

Pines. The yellow pine is found in the vicinity of Knoxville, and on many of the parallel ridges in the Valley of East Tennessee. It is also found in considerable forests on the Cumberland Table-land, and forms considerable belts in Hardin and Lawrence counties. The white pine is not so abundant. It is diffused in more or less quantities over the slopes of the Unaka Mountains, and locally on the Cumberland Table-land.

Poplar. No State can boast of finer specimens of this tree. It grows upon rich soils everywhere. In Obion and Dyer counties in West Tennessee, and in Maury, DeKalb and Macon of Middle Tennessee, are as fine poplar groves as can be found on the continent. Trees from twenty to twenty-five feet in girth, and from sixty to eighty feet to the first limb, are often met with.

Sassafras. As a tree the sassafras in West Tennessee takes its place among the lordliest of the forest. A section of one cut near Union

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City, and exhibited at the Industrial Exposition at Nashville, measured sixty inches in diameter, exclusive of the bark.

The *Sycamore or Buttonwood* grows on the margin of streams in almost every portion of the State.

The *Tupello* abounds in swampy places in West Tennessee.

Walnut, Black. This is probably the most valuable timber tree in the State. It exists in considerable quantities on the slopes of the Cumberland Table-land, in the Central Basin and on the better portions of the Highland Rim. On the line of the Cincinnati and Southern Railroad there are extensive groves of it.

The *White Walnut* is found growing on the margin of streams and in the better portions of Middle and East Tennessee.

There are various other forest trees in the State, but those mentioned constitute the chief timber trees Altogether Tennessee is a well timbered State, and enough remains to last for generations, if used with economy.

Poplar lumber ranges in price per hundred feet, from $1 to $2; oak from $1.50 to $3; cedar from $2 to $4; ash from $1.50 to $3; walnut from $2 to $4. The smaller sums named are the prices demanded at saw-mills in the best timbered regions; the larger sums are the prices in Nashville and Memphis.

FARM PRODUCTS.

Tennessee ranks sixth as a corn-growing State. In 1840 it stood first. Its average annual production of this great cereal is not far from 50,000,000 bushels. The great Central Basin of Middle Tennessee, the rich valleys of East, and the lowlands of West Tennessee raise enormous crops of this grain, and the quality is greatly superior to that grown in higher or lower latitudes. The grain matures earlier than in the north, and dries thoroughly, fitting it to make a superior quality of meal, and it is noted for its freedom from rot. The average yield per acre for the State is about twenty-three bushels; but this average is low, due to the pernicious habit in some parts of the State of planting the same land year after year in this exhaustive crop without manure. Among the best farmers, those who practice rotation and clovering, the average yield is not far from forty bushels. The rent paid for some of the bottom lands on the upper Tennessee is twenty and sometimes thirty bushels of corn per acre, and the yield often reaches seventy-five, and in some rare instances, one hundred bushels per acre.

Wheat. The usual quantity of wheat raised varies from 5,000,000 to 10,000,000 bushels, with an average yield per acre of from seven to nine bushels. About 1,000,000 acres are sown annually. The best wheat-growing portions of the State are to be found in the upper counties of the Valley of East Tennnesee, and the counties lying on the north side of the Highland Rim, the northern counties of West Tennessee, and the rolling lands of the Central Basin. The average in

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these regions is not far from fifteen bushels. It could be raised to twenty by the exercise of more intelligence on the farm. Though the average yield of wheat is far from being what a thorough preparation of the land and early seeding could make it, yet the excellence of the berry compensates in some degree for the scantiness of the yield. The flour made of Tennessee wheat commands in every market a superior price. This fact, and its cause, is clearly stated by Henry C. Carey, the distinguished political economist:

"Even before the war a great change had commenced in regard to the sources from which northern supplies of cereals were to come, Tennessee and North Carolina furnishing large supplies of wheat, *greatly superior* in quality to that grown on northern lands, and commanding higher prices in all our markets. The daily quotations show that southern flour raised in Missouri, Tennessee and Virginia, brings from three to five dollars more per barrel than the best New York Genessee flour; that of Louisiana and Texas is far superior to the former even, owing to the superior dryness, and the fact that it contains more gluten, and does not ferment so easily. Southern flour makes better dough and maccaroni than northern or western flour, it is better adapted for transportation over the sea, and keeps better in the tropics. It is, therefore, the flour that is sought after for Brazil, Central America, Mexico and the West India markets, which are at our doors. A barrel of strictly southern flour will make twenty pounds more bread than Illinois flour, because, being so much dryer, it takes up more water in making it."

Add to this the fact that the Tennessee harvest precedes that of New York and the North-western States by nearly a month, and the wheat crop comes in upon a bare market, and it becomes evident that, so far as quality and time of selling go, our statement of the superiority of Tennessee as a wheat section is borne out.

Oats. Tennessee annually produces about 5,000,000 bushels of oats. The best authorities put the yield at sixteen bushels per acre, but the primitive methods employed in separating the straw from the grain leave a large portion of the latter adhering to the straw. Twenty-five bushels per acre can be grown upon any soils in any portion of the State that have not been impoverished by bad tillage. Even upon the thin, barren, flat lands that are found upon the highlands in Lewis, Lawrence, Coffee, and other counties, oats grow with a prodigal luxuriance, as also upon the sandstone soils of the Cumberland Table-land. Upon the richer valley and bottom lands fifty bushels per acre is not considered an exorbitant yield, and seventy-five have been made. Greene, Hawkins, Knox, Sullivan, Roane, Washington and Blount, in East Tennessee; Davidson, Wilson, Montgomery and Sumner, in Middle, and Obion, Dyer and Gibson in West Tennessee, furnish the best soils for oats.

Tobacco. Tennessee stands third as a tobacco-growing State, Kentucky being first and Virginia second. The annual product of this

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great staple varies from 20,000,000 to 25,000,000 pounds, or from 13,000 to 22,000 hogsheads. The average yield per acre is about 800 pounds, though as much as 1,200 and 1,500, and even 1,800 can be grown upon the best soils in good seasons. It acquires a peculiar richness grown in some of the soils of Kentucky and Tennessee. Tough, thick, gummy and leathery in its character, it has the capacity of absorbing water, which makes it peculiarly adapted to the manufacture of strips for the English market. The tobacco known as the "Clarksville tobacco," and which grows on the rich red soils of Stewart, Montgomery, Robertson, Cheatham, Dickson, and in the counties of Kentucky lying contiguous to the three counties first named, will absorb about thirty-three per cent. of water when dry. The quality of the tobacco grown in these counties is of such excellence, that it is well known in all the tobacco marts of the world. The farmers, however, by overcropping and inattention to housing, stripping and firing, have reduced the standard until it comes in competition with the inferior grades grown elsewhere. If, instead of planting so much, they would plant less upon lands well manured, and thus raise the best style of tobacco, as they can do, they would have competition from but one place in the United States, and that is the lands on the James river in Virginia. A great error is committed in aiming at quantity instead of quality. The region around Clarksville is singularly favored in the peculiar composition of the soil and in the inscrutable agency of climate for the production of this crop. Under judicious culture and correct management the farmers may grow a quality of tobacco that can be grown in no other place in the Mississippi Valley. In raising an inferior article they are thrown in competition with the farmers of Indiana, Illinois and Missouri, who can produce a low grade much cheaper, because the soils in those States will yield a greater number of pounds per acre. Manifestly it would be to the highest and best interest of the farmers to produce the highest type, and thus avoid competition, and secure a better price. For this reason small farmers would do well. Indeed, there are but few places in the South where intelligent farmers could do better. By careful management a skillful tobacco raiser can oftentimes realize from $150 to $200 per acre.

The upper parts of Sumner, Trousdale and Smith, all of Macon, Clay and Jackson, and parts of Overton, Putnam, Wilson and DeKalb, raise an article of tobacco principally consumed in the French and Spanish markets, a small quantity going to Italy and Germany. Obion, Dyer, Henry, Weakley and Benton counties, in West Tennessee, raise a very fine manufacturing leaf. It is, indeed, the finest article for that purpose grown west of the Alleghany mountains. It is rich, silky, mild, of a light color, some of it rivalling the brilliant colors of the fading hickory leaf. It is especially valued for bright and mottled wrappers. All of this tobacco is consumed in the United States, none being exported on account of its high price and scarcity. This tobacco is not so well adapted for stemming purposes, and even if it

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were, the price is too high to make its use in this manner profitable.

Coffee, Warren, Moore, Lewis, Lawrence, Wayne, Hickman, Humphreys and Dickson raise small quantities of light, mild tobacco.

Nearly every county in East Tennessee grows tobacco enough for home consumption.

Cotton. This is one of the great staple products of Tennessee. In 1850 the number of bales raised in the State was 212,000; in 1860, 296,464; in 1870, 181,842. The number of acres devoted to this staple in the State was for 1870, 526,180; in 1871, 489,352; 1872, 552,403; 1873, 613,267.

The best cotton in the State is grown on the lands in the southern half of West Tennessee. The staple is long and heavy, and the average yield on the best lands per acre is from 1,000 to 1,200 pounds of seed-cotton. The farmers in this portion of the State give to this staple almost their entire attention. The uplands yield a very desirable article, much sought after by the spinners of New England and Great Britain on account of its cleanness. At the London Exposition in 1851, the cotton raised by Col. John Pope, of the county of Shelby, received the medal as the best cotton known to the world.

Cotton is grown in the whole of the Central Basin south of Nashville. Lincoln, Rutherford, Giles, Davidson and Maury are the principal cotton-growing counties in Middle Tennessee, these five counties producing annually about 40,000 bales. The quality of the staple grown in Middle Tennessee is inferior, being generally short and light, though this varies greatly with the season. The crop of 1873 was a very superior article, and resembles the best "uplands" of Mississippi.

The best counties for cotton growing in West Tennesse, arranged according to their productiveness, are Shelby, Fayette, Haywood, Tipton, Gibson, Madison, Lauderdale, Carroll and Dyer. The cotton area has been extending north during the past two or three years into Lake, Obion and Weakley. The average annual production for West Tennessee is not far from 160,000 bales.

Hay and Grasses. About 90,000 acres of land in Tennessee are used for the raising of hay, which yield about 110,000 tons, or about one and a quarter tons per acre. This crop is valued at nearly $2,000,000, and is one of the most useful crops grown in the State, and one which is peculiarly adapted to the numerous bottoms that skirt the many streams throughout the State. No State is more abundantly supplied with water-courses, and the hay crop of the State might be made to rival that of the great States of New York and Ohio, if farmers would seed the rich alluvial bottoms to timothy and herds-grass. Nor is the hay-growing portion of the State confined to the lowlands bordering on the streams. On the northern slopes of the ridges of East Tennessee, and on the rolling lands of the Central Basin, timothy grows with a surprising luxuriance; and upon the flat lands of the Highland Rim, and in the sandy lands of West Tennessee, herds-grass finds a fitting soil, and grows to a height almost incredible. Knox, Greene, Sullivan and Washington, in East Tennessee, are

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among the best hay-growing counties in the State. Greene is the banner county, and Davidson stands second. Considerable hay is grown in Carter and Johnson, 2,000 feet above the sea. Were the rich bottoms of the Mississsppi reclaimed and put to hay, Tennessee might supply the entire Southern States with that article.

While the average yield of hay for the State is small, instances are given where meadows favorably located have yielded, for a period of ten years in succession, from two to three tons per acre.

Barren or prairie-grass springs up through the woods in many of the counties about the first of April, and furnishes abundant grazing until the first of August. Wherever the forest is not so dense as to exclude the light and heat of the sun, on the streams and table-lands of the Cumberland Mountains, and on the sandy, flinty and siliceous "flat woods" of the whole State, this grass still holds possession where the domestic animals which roam at large are not numerous enough to keep it down.

Nimble Will, white clover and crab-grass grow on rich limestone soils in the woods and fields, and supply good grazing. Herds-grass, timothy, and the millets, are relied upon for hay; meadow oat-grass, orchard-grass and blue-grass for pasture, and red clover for hay, grazing and as a fertilizer. On all limestone soils clover grows with great luxuriance, but the blue-grass region is confined mainly to the Central Basin.

Rye. This cannot be regarded as a staple crop, though the soil and climate both are adapted to its growth. It is rarely sown except for winter and early spring grazing, or as a renovator of the soil. Sown in September on fertile, well prepared soils, it forms a complete mat before the cold days of December. Sheep, cattle and horses eat it with avidity, and the usual custom is to graze it in the spring until the clover fields or highway pastures will supply ample feed.

Barley. While the number of acres devoted to barley in the State does not exceed 5,000, it is yet one of the most profitable crops grown by our farmers. The average yield per acre is about eighteen bushels. About one-third of all that is grown in the State is raised in Davidson county. It flourishes well in the high valleys and coves in Johnson and Carter counties, and would grow well in all the rich valley lands of East Tennessee. The black lands of the Central Basin yield very large crops. Upon such lands twenty-five to thirty-five bushels per acre is quite a common yield. Stock-raisers prefer it to any other grain for the feeding of young colts.

Sweet Potatoes grow well on all well drained soils of the State, and especially where the land is friable and of moderate fertility. Bottom lands are not usually the best for the growth of this vegetable; the tendency of such places is to produce an enormous growth of vines at the expense of the tubers; nor does cold, clayey land suit them. The flavor is greatly improved in a soil with a small admixture of sand or fine gravel. When grown upon very rich soils they are apt to be sappy and insipid. Visitors from the North at the exhibition of the

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Nashville Agricultural and Mechanical Association expressed more surprise at the size and excellence of the sweet potatoes than of any other vegetable. They may be grown on suitable soils at the rate of 100 bushels per acre. The annual yield is 1,200,000 bushels. They are grown in every division of the State. The counties raising the greatest quantities are Shelby, Obion and Gibson, in West Tennessee; Davidson, Wilson and Montgomery, in Middle; and Knox, Bradley and Anderson, in East Tennessee. Davidson raises by far the greatest number, when counties are compared; but West Tennessee when we compare divisions. The elevated land of the Unakas is not suited to their growth, the climate being too northern in its character.

Irish Potatoes. Prolific in yield when planted upon suitable soils and well worked, there is no good reason why Tennessee should not supply this vegetable to all the States South. Upon land moderately fresh and well manured, the yield can be brought up to 400 bushels per acre. Yet the statistics of this crop show an average yield of only seventy-seven bushels, and the number of bushels raised 1,122,000. This shows that there is not one bushel to each inhabitant. The Irish potato grows well in every division of the State, and especially is it brought to great perfection on the elevated areas. The Cumberland Table-land, though yielding but sparsely of the leading crops, produces the Irish potato in profusion. The tubers grown upon the sandstone soil of this division are well flavored, rich and mealy. No more profitable crop, and no one for which there is a readier demand, can engage the attention of Tennessee farmers. The potato bugs sometimes destroy the late potatoes, but rarely ever injure those planted in February or March. As yet the genuine Colorado bug is unknown in Tennessee.

Peanuts. The great peanut-growing region of the State embraces the counties of Perry, Hickman and Humphreys, and portions of Dickson and Lewis—all upon the west side of the Highland Rim. The entire production of peanuts in the State reached, in the year 1872, 680,000 bushels. Of these Hickman made 200,000, Humphreys 250,000, Perry 200,000, and Dickson 30,000. The excessive production for that year reduced the price so low that the crop was diminished to 110,000 bushels for the year 1873, of which Hickman produced 40,000, Humphreys 40,000, Perry 27,000, and Dickson 3,000. The prices paid in the Nashville and Cincinnati markets vary from 60 cents to $2.25 per bushel, according to production, quality and demand. The average yield is about forty bushels per acre. Land suitable for peanuts has advanced 100 per cent. since their first introduction as a crop in the region named. The best soils for peanuts are those which are well drained, and have a large quantity of intermingling gravel. Rich, generally flinty, bottoms, lying between ridges are favorite spots.

It may be well to state that the estimates of the yield of crops are based upon a very poor specimen of farming, and under a more judicious culture the productions of the soil might be increased from fifty to one hundred per cent.

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Other Products. In addition to the foregoing crops, there are grown in particular localities hemp, broom-corn, flax, sorghum and rice. All the garden vegetables are raised in abundance. Peas, beans, onions, lettuce, cabbage, turnips, radishes, salsify, celery, cucumbers, butter-beans, tomatoes, squash, melons, carrots, beets, okra, egg-plant, asparagus, and many others are found in almost every garden.

It is thus seen that Tennessee grows almost every product to be found North or South. Nor is this to be wondered at. The many varieties of soil and the difference of elevation give to Tennessee a very wide range in its agricultural products. Assuming that an elevation of 333 feet is equivalent, so far as temperature is concerned, to one degree of latitude, it will be seen that the highest domes of the Unakas, in the east, differ from the lowlands of the Mississippi by nearly fifteen degrees of latitude—the one having a semi-tropical climate, the other that of Canada. We have seen, also, that the soils do not differ less than the climate.

Fruits of all kinds grow well. Peaches, that attain their most luscious sweetness in a sunny climate, find in the State a congenial home, where they are brought to their highest perfection. Apples, upon the elevated lands, bear as profusely and ripen as deliciously as in the great apple-growing region of Ohio. Grapes of many varieties bear in unsurpassed luxuriance upon the sunny slopes and rich hills in every part of the State. Vineyards of all sizes, from one acre to forty acres, are being planted in every division of the State, and the certainty with which they bear and ripen assures for Tennessee, in the near future, a high pre-eminence as a grape-growing State. 10,000 pounds of grapes per acre have been sold from some of the vineyards. Plums and apricots, pears, quinces, nectarines, cherries, strawberries and currants flourish and yield in profusion. Even the fig, in sheltered places, may be brought to maturity in the open air. Nor must that much-used but greatly abused fruit, the blackberry, and its congeners, the raspberry and dewberry, be passed without mention. Everywhere throughout the State the bushes are indigenous. In the woods and in the fields, on poor soils and on rich, covering the mountain tops and flourishing in the alluvial bottoms, the blackberry bush supplies a rich, healthy and delicious fruit, and in quantities sufficient to supply ten times the present population. So numerous and so excellent are the berries that pickers are sent out from Cincinnati and from other towns north to gather and ship the fruit. The raspberry, huckleberry and the dewberry grow wild and yield abundantly. The cranberry grows wild in the elevated swampy places of Johnson county, and but for want of facilities for transportation, could be made a source of great profit. These berries, covering in the aggregate an area of 10,000 acres, are equal in all respects to the best grown in the North.

Honey. Considerable attention is being paid to the production of honey. It is claimed by eminent bee-raisers that Tennessee has the best climate and the greatest variety of food for bees of any State in the Union, it having all the forage of the Northern States, and all to

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be found in the Southern, while it has some that is not found in either. The white clover, golden rod and aster are not found in States further south. In the extreme South the honey is not so good, nor are the bees disposed to lay up stores of food, as they can be furnished with supplies outside almost throughout the year. The climate of Tennessee being a medium one, with mild and short winters and agreeable summers, and with the delightful seasons of the fall and spring, makes the State specially adapted to bee-culture. The late Dr. Hamlin, one of the most extensive and eminent bee-raisers in the United States, says the bees and queens reared in this climate are large, thrifty, and not excelled by any he has met with from any portion of the world. He further says, that no State or section of country, with which he is acquainted, equals Tennessee in all the departments of bee-culture. We suffer less in the loss of bees in winter, and from those diseases to which they are subject in other localities. Some of the most destructive diseases are unknown in Tennessee.

LIVE STOCK.

Tennessee, taking the ninth rank in the sisterhood of States in the number of her population, aggregating 1,258,520, according to the last census, takes also the ninth position in point of the value of her live stock, aggregating in value $55,084,075. With only 6,843,278 acres improved land, there is about one-fourth of the area of the entire State, making about five acres to each inhabitant, actually available and employed. According to the latest and most reliable data, there are for each one hundred acres so employed, only 3.6 horses, 3.5 milch cows and 5.8 all other cattle, 12 sheep, and 26 swine. Considering the vast area unemployed and unreclaimed, embracing as it does much of the best lands of the State for the production of the cereals and cultivated grasses, together with our climate and admirably watered valleys, so well adapted to stock-growing, that notwithstanding the aggregate value of our live stock making a large item in the wealth of our State, the percentage appears very low when compared with the real capacity of our territory for the development of this great interest. Even under the unadvanced system of agriculture, Tennessee takes the seventh rank in the average production of Indian corn and wheat, and the fifth in that of grasses, demonstrating our great capacity to make meat for the markets of the world. We think it must appear to the most casual observer, upon a review of such facts, that a proper development of our live stock interest, especially if aided by the fostering hand of our law-makers, will do more to furnish a market for our farm products, and reclaim our worn-out lands, bringing into subjection our wild territories, and thus beautifying and enriching our State, than any other branch of agriculture pursued by the husbandmen of Tennessee.

Horses. From an early day Tennessee horses have been sought by almost every State in the Union for breeding purposes. Nowhere in the United States can purer blood be found than in the counties of the Central Basin.

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For the production of fine wool no State has ever surpassed, if any has ever equaled Tennessee. The late Mark R. Cockrill wrested the premium for the finest fleece at the London Exhibition from the assembled wool-growers of the world. If proper protection were given to this branch of husbandry, Tennessee would soon be filled with the finest and largest flocks of sheep on the continent.

Cattle. Almost every variety of the bovine species is to be found in the State; and in the counties of Davidson, Sumner, Bedford, Rutherford, Giles, Maury, Tipton, Shelby, Knox, and others, there are fine herds of Short-horns, while others are gradually introducing them, and the day cannot be far distant when Tennessee, with the natural advantages of soil and climate, must take high rank as a breeding State, furnishing a large proportion of the animals for the propagation of their species, now demanded by the great west; also taking high rank among the States in the value of her products of beef and the dairy, thus adding millions to her coffers, and prosperity and happiness to her people. Those who are at all familiar with our agricultural exhibitions, and who are well informed as to the great degree of excellency produced by skill and care, attest the fact that the State boasts many specimens of great merit, annually brought into competition, thus producing a laudable rivalry, that is rapidly adding thousands to the wealth and prosperity of our State. Tennessee is destined in the future to become a famous dairy district. Its advantages are:

1. Comparative cheapness of pasture lands, being about one-fourth the price of those of the same quality in Ohio and New York.
2. The adaptability of these lands for the growth of the various grasses—among others the celebrated blue-grass of Kentucky.
3. The length of the growing season, and consequently the increased flow of milk from green food.
4. The mildness of the weather and the short time that cattle have to be housed and fed.
5. Active demand at high prices for all dairy products, and the regularly increasing consumption of them.
6. The great number of pure, sparkling springs.

Hogs. Many persons from distant States, from old breeding districts, as well as our own citizens, who have attended our agricultural fairs of late, have expressed great admiration for the number and quality of the hogs exhibited; indeed, such is the interest and laudable rivalry manifested to secure the best, that many importations are coming into the State from Europe at great expense. Many of the different breeds have been introduced with success; among them the Berkshire, Essex, Poland China, Neopolitan, Sussex, and others, each having their champions and especial admirers; but we believe the Berkshires, in their adaptation to the climate and wants of our people, have the most advocates. Such is the perfection to which the hogs of the State are now bred, it is exceedingly questionable whether as fine specimens cannot now be found in Tennessee as are either in the United States or Europe.

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The State is at present producing twenty-six hogs to the 100 acres of land in actual cultivation, making the percentage about 145 hogs to each 100 inhabitants; whereas, we might easily produce one hog to every acre cultivated, in addition to other necessary live stock, making five times as many hogs as the State has population, increasing our surplus meat to at least 100,000,000 pounds; and this, too, with manifest benefit to our lands, and an addition of $2,000,000 net to our revenue. If we mistake not, in a very few years the State of Tennessee will become one of the great meat marts for the South. As such it certainly offers very great inducements, both to the emigrant from the old world, and the ice-bound, sterile land-owners of the Northern and Eastern States, who are desirous of seeking new fields for the development of skill and labor, in the pursuit of the pleasant and remunerative industry of stock husbandry. To all such we say, that no enterprise promises a better reward for so small an outlay of capital as stock-growing in Tennessee.

FACILITIES FOR TRANSPORTATION.

Rivers. The Mississippi river has a shore line, by its meanders in the State, 150 miles in length, and affords steamboat facilities to the counties of Lake, Dyer, Lauderdale, Tipton and Shelby. Of its tributaries in the State the Forked Deer, (with its confluent, the Obion,) Big Hatchie, Loosa Hatchie and Wolf, are navigable for small steamers from twenty-five to fifty miles each, and are floatable to much greater distances. The Tennessee river is the largest tributary of the Ohio, and the main stream has 660 miles of navigable water. From Knoxville to Chattanooga by river, is 200 miles; from Chattanooga to the Muscle Shoals, 200 miles, and from the foot of Muscle Shoals to the Ohio river, 260 miles. From Loudon to Chattanooga, a distance of 160 miles, the river almost dashes itself against the great coal and iron fields of the State. Water transportation is afforded to the counties of Knox, Loudon, Roane, Rhea, Meigs, James, Hamilton and Marion, in East Tennessee; and to the counties of Hardin, Decatur, Wayne, Perry, Humphreys, Benton, Houston, Henry and Stewart of Middle and West Tennessee—nearly all of which are rich in iron deposits and hydraulic rock. The river from Florence, Alabama, to the Ohio, is navigable for large steamers throughout the year. Of the tributaries of the Tennessee, the Holston, French Broad, Little Tennessee, Clinch, Hiwassee, and their confluents, furnish floatable waters for a majority of the counties in East Tennessee, and a large amount of produce is annually brought down in flatboats and barges, while Duck river and Big Sandy, also tributaries entering below the Muscle Shoals, are used for the same purpose.

The Cumberland river is a most remarkable stream. Though but 650 miles in length, 595 may be made navigable, and of the navigable part 304 miles are in the State of Tennessee, supplying steamboat facilities for eight months in the year to the counties of Clay, Jackson, Smith, Trousdale, Wilson, Sumner, Davidson, Cheatham, Dickson,

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Montgomery, Houston and Stewart. The last four counties are rich in iron ore, while the upper part of the stream pierces the coal-beds of Kentucky, which are capable of furnishing an inexhaustible supply of fuel. From State Line, where the river enters the State, to Nashville, is 229 miles; from Nashville to the mouth of the river, 192 miles. From 350,000 to 500,000 bushels of coal are annually brought down the river from Kentucky to Nashville and points below. Nine furnaces are in operation on the river between Nashville and its mouth. Altogether there are over 1,200 miles of navigable waters in the State, and half as much more floatable.

Railroads. The Nashville and Chattanooga Railroad traverses the heart of the richest section of the State, furnishing transportation to the counties of Davidson, Rutherford, Bedford, Coffee, Moore, Franklin, Marion and Hamilton. It also throws out arms to Shelbyville and Jasper, taps the coal region at Cowan, intersects the valley of the Tennessee river, penetrates a considerable portion of the cotton and grain-growing region of Alabama, and then on through a rich coal region to Chattanooga. The main line is 151 miles long; from Wartrace to Shelbyville is a branch road eight miles in length, and from Bridgeport, Alabama, another branch fourteen miles, which opens a fine coal region, making, with siding, in all 184 miles.

The Nashville and Northwestern road passes through the counties of Davidson, Cheatham, Dickson, Humphreys, Benton, Carroll, Weakley and Obion, and terminates at Hickman, Kentucky, on the Mississippi river, where it connects with the Iron Mountain road on to St. Louis. It crosses the Louisville, Nashville and Great Southern Railroad at McKenzie, in Carroll county. Its length from Nashville to Hickman is 172.5, sidings and other tracks eight miles. The last two named railroads have been consolidated, and are now called the Nashville, Chattanooga and St. Louis Railway.

The East Tennessee, Virginia and Georgia Railroad runs from Bristol, on the Virginia line, to Dalton, Georgia, with a branch from Cleveland to Chattanooga. It traverses the counties of Sullivan, Washington, Greene, Hamblen, Jefferson, Knox, Loudon, Monroe, McMinn and Bradley, and by the Chattanooga branch the counties of James and Hamilton. A branch railroad, for a time under the same management, extends from Rogersville Junction to Rogersville, sixteen miles in length. The main road from Bristol to Dalton, Georgia, is 240 miles in length. The branch from Cleveland to Chattanooga is thirty miles long. There are sidings and other tracks twenty-two miles; gauge five feet.

The Cincinnati, Cumberland Gap and Charleston Railroad, operated by the same company as the last mentioned, extends from Morristown, in Hamblen county, to Wolf Creek, and passes through the counties of Hamblen and Cocke. It is thirty-nine miles long.

The same company has control of the Knoxville and Ohio Railroad, running from Knoxville to Careyville, a distance of forty miles, and passes through the counties of Knox, Anderson, and a portion of

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Campbell, tapping extensive coal deposits at Coal creek, and cutting the great dyestone iron vein. Other coal mines are worked at Caryville or Wheeler Station. The amount of coal shipped over this road does not fall short of 75,000 tons annually.

The Knoxville and Charleston Railroad runs from Knoxville to Maryville, in Blount county, and is sixteen miles long. This road was intended to connect with the Blue Ridge Railroad of South Carolina, and form, with the Knoxville and Ohio Railroad, a through line from the Ohio river to the seabord at Charleston, South Carolina.

The road of the Tennessee Coal and Railroad Company runs from Cowan, a village in Franklin county, on the Nashville and Chattanooga Railroad, to Tracy City, the center of the Sewanee coal mining interest, and is twenty-one miles long. Over it are shipped annually over 3,000,000 bushels of coal. It furnishes railroad facilities to Grundy county and a small fraction of Marion.

The McMinnville and Manchester Railroad runs from Tullahoma, in Coffee county, to McMinnville, in Warren county. Its length is thirty-four miles. It was projected to run to Sparta, in White county, and ultimately to extend to the Kentucky line and connect with the Cincinnati Southern. A considerable portion of the route from McMinnville to Sparta has been graded.

The Winchester and Alabama Railroad runs from Decherd, in Franklin county, on the Nashville and Chattanooga Railroad, to Fayetteville, the county seat of Lincoln. It was projected to run to Huntsville, Alabama, a distance of forty-seven miles. Thirty-nine miles are in operation.

The St. Louis and Southeastern Railway traverses one of the most fertile regions of the Mississippi Valley, and also passes directly through the immense coal fields of West Kentucky and Illinois. The quantity of coal shipped to Nashville by this road is estimated to be 449,000 bushels; to points south of Nashville, 100,000 bushels. All the towns on the line of the road from Henderson, Kentucky, to Nashville are supplied with coal from the mines in Kentucky. The road is admirably located, and the facilities offered for the erection of manufacturing establishments on its route are so great that they cannot long remain unnoticed by capitalists. Cheap living, cheap coal, fertile lands, unoccupied water-power, contiguity to the cotton fields and to the iron regions, are some of the advantages of the country through which this road passes. Good management and liberal rates on the part of its officers must eventually make it one of the most desirable roads leading to Nashville. The total length of this road is 358 miles, forty-eight of which are branches. The distance to St. Louis is 310 miles. Length of road in Tennessee, forty-eight miles. Distance from Nashville to Springfield, the county seat of Robertson county, 28 miles.

The Louisville, Nashville and Great Southern Railway was the first railroad which united the cotton States east of the Mississippi river with the great grain-growing States of the North-west. The wis-

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dom of its projectors is manifested in the fact, that since its main line from Louisville to Nashville was finished, a distance of 185 miles, it has, within a period of fifteen years, thrown out branches and extended its main line, until the aggregate number of miles has reached 737.3, 380 of which are in the State of Tennessee. The counties in the State furnished with transportation by this road are, on its main stem Sumner and Davidson; on the Memphis branch, (which diverges from the main stem at Bowling Green, Kentucky,) Montgomery, Houston, Benton, Henry, Carroll, Gibson, Crockett, Haywood, Tipton, Fayette and Shelby; on the Decatur branch, (extending from Nashville to Decatur, Alabama,) Davidson, Williamson, Maury and Giles. The Memphis branch crosses the St. Louis and Southeastern Railroad at Guthrie, nearly on the line separating Tennessee and Kentucky, 48 miles northeast of Nashville; the Nashville and Northwestern railroad at McKenzie, in Carroll county; the Mississippi Central at Milan, in Gibson county, and the Mobile and Ohio at Humboldt, also in Gibson county.

The Tennesse and Pacific Railroad runs from Nashville, Tennessee, to Lebanon, the county seat of Wilson. Length 31 miles. It was projected to run to Knoxville, Tennessee, but financial embarrassments checked its progress.

The Mobile and Ohio Railroad extends from Mobile, Alabama, to Columbus, Kentucky, where it makes connection with the Iron Mountain Railroad of Missouri. It enters West Tennessee from the south, crossing the State line in McNairy county, and ranges thence in a direction a little west of north through the counties of McNairy, Madison, Gibson and Obion, passing out of West Tennessee at Jordan's Station, on the Kentucky line. This road crosses the Mississippi Central Railroad at Jackson, in Madison county, the Memphis and Louisville at Humboldt, in Gibson county, the Memphis and Paducah at Troy Station, in Obion, and the Nashville and Northwestern at Union City, also in Obion county.

The Mississippe Central Railroad extends from New Orleans, Louisiana, to a point on the Ohio river opposite the city of Cairo, Illinois, there connecting with the Illinois Central Railroad. It enters West Tennessee from the south-west, in Fayette county, ranges thence northeast through the counties of Fayette, Hardeman, Madison, Gibson and Weakley, thence into Kentucky, crossing in its route the Memphis and Charleston road at Grand Junction, in Hardeman county, the Mobile and Ohio at Jackson, in Madison county, the Memphis and Louisville at Milan, in Gibson county, and the Nashville and Northwestern at Martin's, in Weakley county.

The Memphis and Charleston Railroad extends, as its name indicates, in the direction toward Charleston, South Carolina. In its route it ranges east, passing through the counties of Shelby, Fayette, Hardeman and McNairy, thence into Mississippi at a point on the southern line of McNairy, about twelve miles east of where it touches the western line. In its route through West Tennessee, it crosses the Mississippi Central Railroad at Grand Junction, in Hardeman county.

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The Memphis and Paducah Railroad is chartered to extend from Memphis, Tennessee, to Paducah, Kentucky, but at present is not completed. From Memphis it runs to Covington, in Tipton county, passing through portions of the counties of Shelby and Tipton. From Paducah it extends to a point a little north of Newbern, in Dyer county, leaving a gap which is yet to be completed. Work upon this road is progressing very satisfactorily, and when completed from Memphis, it will range north-east, passing through the counties of Shelby, Tipton, Lauderdale, Dyer and Obion, and crossing, in its route through West Tennessee, the Mobile and Ohio road at Troy Station, in Obion county, and the Nashville and Northwestern at Paudcah Junction, also in Obion county.

The Mississippi and Tennessee Railroad, extending from Memphis, Tennessee, to Grenada, Mississippi, leaving Memphis, ranges south, and passes through a portion of Shelby county, which is the only county in West Tennessee that is touched by this road.

The roads named below are projected or in course of construction:

Memphis and Knoville. A portion of this railroad, (narrow guage) in West Tennessee, is now under contract and the work of grading is progressing. The route passes from Memphis on through Somerville, Bolivar, crossing the Mobile and Ohio Railroad at Henderson's Station, thence through Henderson county, striking the Tennessee river at Saltillo, in Hardin county. From this point to Clifton, in Wayne county, a distance of seventeen miles, connection will be made through the means of steamboats. From Clifton the road will run on through Waynesboro, Lawrenceburg and Pulaski, effecting a junction with the Winchester and Alabama road at Fayetteville, in Lincoln county. An arm of this road will pass from near Wayne Furnace, through Lewis county, to Columbia. Perhaps no road in the State will pass through a more interesting section of country. From Memphis to Saltillo it will pass through the heart of the cotton region of West Tennessee, and from Clifton to Lawrenceburg it will run over deposits of limonite iron ore. Hydraulic rocks and marbles of valuable varieties will form the foundation of the road-bed for many miles. The route east of the Tennessee river offers favorable locations for immigrants. Land is cheap, the country high and healthy, and the soils of moderate fertility, from the Tennessee river to a point twelve miles west of Pulaski, where the road will descend into the great limestone basin of Middle Tennessee, the fairest and the most beautiful portion of the State. In this basin it continues its course to Fayetteville. By continuing on to the Cumberland Table-land, it will be the means of connecting the coal with the iron ore of the Western Belt, and will also give to West Tennessee coal facilities hitherto not enjoyed, and open the grain-growing and stock-raising regions of the State with the cotton-producing section.

The Brownsville and Ohio. This road (narrow guage) will run from Cairo, Illinois, to Brownsville, in Haywood county, through Bolivar to Middleton, and there will connect with the Middleton and Ripley

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road. Twenty-five or thirty miles are graded from Brownsville north.

The Cairo and Tennessee. This road is to be built from Cairo, Illinois, to Paris, the county seat of Henry county, and from thence an arm extended to Johnsonville to connect with the Duck River Valley Railroad—the main line running through Clifton, in Wayne county, to Florence, Alabama. Considerable amount of stock has been taken, and the road is now being surveyed preparatory to letting out contracts.

Tennessee Central. This road was first chartered in 1847, and re-chartered during the session of 1869–70. It is designed to run from Huntingdon, the county seat of Carroll county, on through Gibson, Crockett, a corner of Haywood, and through Lauderdale to the Mississippi river, at Fulton. It penetrates the heart of one the finest farming regions of the State, and its course from east to west gives it great advantages over roads running north and south.

This road has twenty-five miles of road-bed graded. It will form a link in the great inter-oceanic route from Norfolk, Virginia, or Charleston, South Carolina, to the coast of California. The prospect for its speedy completion is good. The cost from Huntingdon to the Mississippi river, it is estimated, will be $366,000.

Memphis and Raleigh (Narrow Gauge). This road runs out from Raleigh to a point on the Memphis and Louisville road, a distance of some seven miles. We have no official information in regard to it.

Cincinnati Southern. One of the most important projected roads is the Cincinnati Southern, from Cincinnati to Chattanooga, passing over the Cumberland Table-land to Emeryville, and thence along its eastern edge, and opening one of the finest coal and iron regions in America. The Kentucky end of this road is now under contract, and proposals have been issued for work on sections in Tennessee. The estimated cost of the road is $15,000,000, of which Cincinnati subscribed 10,000,000.

Cumberland and Ohio. The Cumberland and Ohio Railroad is in process of construction, and will pass from some point on the Ohio river, through Eminence and Scottsville, Kentucky, Gallatin, Tennessee, on to Nashville. Sumner county has taken stock to the amount of $300,000. There is little doubt of its early completion. This road will give a new competing line to the Ohio river.

The Owensboro and Russelville Railroad is also projected to pass through Sumner county.

The Duck River Valley Railroad, (narrow gauge) running from Johnsonville on the Tennessee river, through Centerville, the county seat of Hickman, to Columbia and on to Lewisburg, Marshall county, to Fayetteville, the county seat of Lincoln, will probably be built within the next two or three years, and will open a rich agricultural region. The amount of subscription is $242,500.

Several more roads were projected, but the financial crisis of 1873 will render their construction, for a time, a matter of doubt. Among these is the Ducktown Narrow Gauge, running from Cleveland to

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Ducktown. Two miles of this road are now in operation. Also one from Nashville to Clarksville, (narrow gauge) is being surveyed, with some prospect of being built. A narrow gauge, five miles long, from Rockwood Landing to Rockwood Furnace, in Roane county, has been in operation for some years. It does all the carrying business from the river to Rockwood. A narrow gauge road is also partly graded from Greeneville, the county seat of Greene county, to the foot of the Unaka Mountains, where there are rich deposits of iron ore, and where two blast furnaces have been in operation for a number of years.

PUBLIC SCHOOLS.

There are public schools in operation in every county of the State. The permanent school fund amounts to $2,512,500, upon which interest is paid semi-annually. The tax by the State for the support of schools is ten cents on the $100, and the poll tax of one dollar. There are annually added to the permanent school fund the proceeds of all escheated property, of all property accruing to the State by forfeiture, of all lands sold and bought in for taxes, of the personal effects of intestates having no kindred entitled thereto by the laws of distribution, and donations made to the State for the support of public schools, unless otherwise directed by the donors. Only the interest derived from the permanent school fund can be used for the support and maintenance of public schools.

The law declares that when the money derived from the school fund and taxes is not sufficient to keep up a public school for five months in the year, in the school districts in the county, the County Court shall levy an additional tax sufficient for this purpose, or shall submit the proposition to a vote of the people, and may levy a tax to prolong schools beyond the five months. This tax must be levied on property, polls and privileges liable to taxation, but shall not exceed the entire State tax. The tax so levied shall be collected as other county taxes, and distributed by the County Trustee to each school district, in proportion to the scholastic population. The State Treasurer and County Trustee are required to keep the school moneys separate and apart from State and county funds. The Comptroller is required to apportion all school moneys in the treasury, on the first Mondays in October and April of every year, among the several counties according to their scholastic population as reported to him by the State Superintendent.

Civil districts are invested with power to levy an additional tax not to exceed three mills on the dollar.

The scholastic population embraces all persons between the ages of six and eighteen. Separate schools for white and black is a constitutional provision.

Orthography, reading, writing, arithmetic, grammar, geography, elementary geology of Tennessee, and history of the United States shall be taught in every school. Vocal music may be taught. Other branches shall not be introduced except as provided for by local taxation, or shall be allowed by special regulation upon the payment of

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such rates of tuition as may be prescribed. The fund so derived to go into the fund for the support of the respective schools in which it may be collected.

The State is abundantly supplied with high educational institutions.

EAST TENNESSEE.

East Tennessee has been well named the Switzerland of America. Its towering mountains locking up deep, rich and verdant valleys and coves, its succession of ridges and valleys, its magnificent forests, its roaring streams, the general fertility of the soil, the glory of the climate, the salubrity of the atmosphere, the sublimity, beauty and picturesqueness of the scenery, the freshness and voluptuous abundance of the country, all conspire to make it one of the most desirable spots in America. This division of the State embraces about 13,700 square miles, and has a population of 329,112, of which 36,671 are colored, and 26 Indians. The total value of its taxable property for 1873, was $63,550,129; number of polls, 45,701; number of voters, 65,085. It has in operation about 330 miles of railway, with about 130 more in course of construction. It has 150 miles of navigable rivers, and its floatable streams in the aggregate amount to several hundred miles. This division of Tennessee consists of a great wide trough, bounded by parallel mountain sides, that on the east being the great Unaka Mountains, that on the west making up the eastern escarpment of the mountainous coal field of Tennessee. This included trough or valley trends obliquely north-east and south-west, which is the general direction of the great Appalachian chain, and of the Atlantic coast. Measured on the northern boundary of the State, and obliquely to its course, this trough is 100 miles wide, and in the southern fifty miles, and is 180 miles long. One of the remarkable peculiarities of this valley is that its surface is longitudinally fluted by parallel minor valleys and ridges. In this it differs from all other parts of the State. This feature gives a certain direction to its rivers, and more especially to its smaller streams. This trough or great valley is, in the main, the agricultural region of East Tennessee. The principal stream is the Tennessee, the tributaries of which, on the east, are the Watauga, the French Broad, the Little Tennessee and the Hiwassee; on the west the Clinch and the Sequatchie.

Climate. East Tennessee has a climate more equable and pleasant than that of any other part of North America east of the Rocky Mountains. It lies between parallels 35° and 36°4′ north, and its mean altitude is 1,000 feet above the sea level. The prevailing winds are from the south-west and west, and they bring a constant and bountiful supply of rain from the Gulf of Mexico.

Knoxville is the geographical center of East Tennessee, and it occu-

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pies a mean elevation too, so that it may be taken as the climatic center also.

The summer mean at Knoxville, 73° 6′, is about that of Philadelphia, Pennsylvania, as well as that of several points in central Virginia, of Cincinnati, Louisville, Kentucky, southern Indiana and central Illinois. It is that of the central part of Spain, and the northern part of Italy. The summer of the East Tennessee Valley is, therefore, considering its valley-like character and its low latitude, a comparatively cool one. This is mostly due to the considerable elevation of the region above the sea.

According to very careful observations made at the East Tennessee University, under the direction of the United States signal service, at Knoxville,

The mean temperature for the year is	57°
The mean heat for the summer is	74°
The mean cold for the winter is	40°
Average maximum temperature	91°
Average minimum	2°

The result is a mild and equable climate, that combines delightfully the temperate and tropical, without the extremes of either.

The mountains on either side protect the valley from the blighting and chilling northern and north-western winds that so scourge the plains of the north-west, while they act as a natural conduit for the milder and gentler winds that come from the Gulf of Mexico. But even these are tempered into pleasant breezes, by the spurs or cross sections of mountains which break out from the main ranges. Thus it comes, that while it is a very rare occurrence to see the anemometer standing still, destructive storms are never experienced. A happy result of these influences is a degree of exemption from all malarial and atmospheric diseases, unsurpassed in any country. The undulating surface of the land, the great numbers and rapid flow of the rivers, the entire absence of all low and marshy lands, and the constant flow of gentle breezes, keep the atmosphere pure and exhilerating to a delightful degree.

In addition to the healthful climate, the mountain regions abound with all manner of mineral springs, many of them furnishing waters that have been thoroughly tested and long noted for their healing properties, and have of late years become popular resorts for health and pleasure-seekers from all parts of the South.

Agriculture. There is a widely marked and striking difference in the three divisions of the State in the economical management of the farmers. The most distinguishing characteristic of the average farmer in East Tennessee is the effort which he makes to supply what may be required for his own consumption. He is indeed a great provider of the necessaries of life. He is ambitious to live within himself. It is not uncommon on a small farm to see a patch of cotton, which the women of the household work up into cloth; a spot given to tobacco for home consumption; a field of sorghum from which syrup is made for domestic use; a few acres of wheat are raised for flour; corn and

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oats or hay to feed the stock, which usually consist of a few sheep to supply wool for winter clothes, cows from which a considerable revenue is derived by the manufacture of butter, and a brood-mare or two from which the farmer rears his mules and horses for farm use. Besides these, an abundance of the standard vegetables, such as cabbage, beans, peas, potatoes and onions, is raised, as well as of ducks, chickens, geese, guinea-fowls, peafowls, &c. A few bee-hives, and an apple and peach orchard, are the necessary adjuncts to nine-tenths of the farms in East Tennessee. The most striking fact in the farming operations in that division, is that no money-crop, so-called, is raised. Tobacco, cotton, corn and hay, are all grown in small quantities, not so much for sale as for use. The amount of money realized by the average farmer of East Tennessee is painfully small, and yet the people in no portion of the State live so well, or have their tables so bountifully furnished. Many a farmer who lives like a lord at his table, does not realize $200 in money from his entire farm, and this sum comes mainly from the sale of feathers, chickens, eggs, dried fruit, and occasionally a few cattle or mules. Indeed, with their strict habits of economy, the farmers of East Tennessee have but little use for money. The wool and cotton, by the patient industry of the female members of the family, are wrought into cloth. A few hides from the beeves are tanned and made into shoes. Salt, coffee and sugar comprise almost the sum total of purchases, while a few dollars are required to meet the demands of the tax-gatherer. The character of the produce raised for sale in this division has established a barter trade, which is unequalled in extent elsewhere in the State. Almost every neighborhood has its country store, where spun-cotton, calico, salt, sugar and coffee are exchanged for feathers, eggs, chickens, dried fruit, etc. These articles, after being thus collected in considerable quantities, are shipped to Knoxville and other points. The use of improved machinery, except in the valley lands, is impossible on farms in East Tennessee. The consequence is that the implements are very inexpensive, and are frequently made at the neighborhood blacksmith shops. The valley farms are usually supplied with reapers, mowers and horse-rakes, and resemble, in every particular, the best farms in Middle Tennessee. The growing of corn and wheat, for a long period, in East Tennessee, without proper rotation, resting or clovering, has greatly impaired the fertility of the soil.

Labor is abundant in the neighborhood of towns, and commands a less price than in either Middle or West Tennessee. It is probably also more manageable and reliable. Good farm hands can be hired about Knoxville throughout the summer months for $10 and $12 per month. After the corn crop is "laid by," and the wheat harvested and threshed, there is but little employment on the farms. August and September, the busiest months in the tobacco-growing counties, are those of most leisure in East Tennessee. A few farmers, taking advantage of this surplusage of labor in summer, are beginning to grow tobacco for sale.

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Roads. It is a serious drawback to the farming interests of East Tennessee that there are so few good roads. Uusually they are execrable, and especially is this the case where the roads run transversely across the country. No successful efforts have been made to build turnpikes, though rocks are abundant and convenient for that purpose. With the exception of a few miles of macadamized roads leading out from Knoxville, we believe there is not another in East Tennessee.

Stock-raising in portions of East Tennessee is quite profitable, especially on the valley farms, which produce red clover, timothy, blue-grass, herds-grass and orchard-grass luxuriantly. There is quite a number of herds of thoroughbred Jerseys, Devons and Short-horns. Sheep-husbandry is yet in its infancy. The thousands of worthless dogs make this most delightful branch of stock-raising impossible. One of the prominent features of stock-growing as practiced in East Tennessee, is the use made of the luxuriant growth of wild grasses and succulent vines and shrubbery that clothe the mountain sides and tops. Vast areas of unoccupied lands here furnish almost unlimited and inexhaustible range for cattle and sheep, and thousands are driven out every spring to pass the summer in these free pastures, from which they return in the fall as fat as grass can make them.

Fruits. Apples, pears, peaches, grapes, strawberries, and many other kinds grow well in East Tennessee.

"No country in the world," said the late Commodore Maury, "that lies between 36° 36′ and 35° can surpass Tennessee, on account of the rare advantages of climate, in altitude, for abundance of yield, beauty of form or richness of flavor of fruits. The hills, knobs and mountains afford every variety of sub-climate and site that the most fastidious fruit-grower could desire."

What he says of Tennessee is especially applicable to East Tennessee.

The Mineral Resources of this division are extensive and varied. Iron, coal, copper, lead, zinc, gold and marble exist in workable quantities. For a description of these the reader is referred to the Minerals of Tennessee, in another portion of this pamphlet.

The Educational Facilities of East Tennessee are above ordinary. In some of the counties, as Washington and Knox, the system of free schools is in successful operation, and gives general satisfaction. In some of the more thinly populated counties schools are poorly kept up. Several colleges and seminaries are in healthy operation. The Tennessee Agricultural College is located at Knoxville.

Churches. All the leading Protestant denominations have churches scattered throughout the different counties, in which religious services and Sunday-schools are regularly held. The Methodists, Baptists and Presbyterians are most numerous. There are a few Quakers, and at Knoxville and Chattanooga, Roman Catholic churches. All of these denominations have one or more male and female schools or colleges, located in different counties, and are actively alive to the work of spreading the gospel, at the same time that they work most earnestly for the increase of their own sect.

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ANDERSON COUNTY.

ORGANIZED 1801. *County-seat, Clinton*—194,921 acres;* value, $1,088,889; number of farms, 1,034, partly on Cumberland Table-land and partly in East Tennessee Valley; surface very broken and mountainous; watershed between Cumberland and Tennessee rivers; Clinch river traverses center of county, and has several tributaries therein; valleys productive of main crops, corn, wheat and grasses; corn is the staple. Highlands of thin soil mostly covered with dense forests of pine, oak, chestnut, poplar, etc.; coal and iron ore exist abundantly; coal mined extensively at Coal creek; good valley lands high; most of mineral land leased; plateau land at one dollar per acre; numerous mineral and salt springs; very healthy. Population 8,704, of which 928 are colored.

BLEDSOE COUNTY.

ORGANIZED NOV. 30, 1807. *County-seat, Pikeville*—223,348 acres, value $648,033; 481 farms; lies mainly in Sequatchie Valley, almost without outlet; valley land productive when properly cultivated, otherwise only moderately so; mostly in corn to feed stock, which is driven to market; abundance of timber, coal and iron, but no transportation facilities; valley land from twenty to forty dollars, mountain land from one to two dollars. Population, 4,870, of which 709 are colored.

BLOUNT COUNTY.

ORGANIZED JULY 11, 1795. *County-seat, Maryville*—316,561 acres; value, $1,985,134; 1,170 farms; bounded on two sides by Holston and Tennessee rivers, and traversed by Little river and numerous creeks; several ranges of hills of inferior land, balance alluvial or limestone land, with substratum of red clay; fertile coves and valleys; Unakas rise 6,000 feet along the south-east boundary; iron ore crops out in many places; several kinds of marble; copper and other ores found; numerous mineral springs; improved farms three to twenty-five dollars per acre; some of best land badly worn; plenty of land on the market for sale or lease; timber abundant and convenient; good schools. Population, 14,237, of which 1,456 are colored.

BRADLEY COUNTY.

ORGANIZED 1836. *County-seat, Cleveland*—185,137 acres; value, $1,543,358; 1,133 farms; surface—long, straight valleys and hills; valley soil red and mulatto; fertile but badly worn; farms 300 to 800 acres each; plenty of water and fine water-power; markets accessible by railroad; stock-raising convenient; no malaria; excellent schools and church facilities; limestone the prevailing rock; abundance of pine, oak, hickory and other timber. Population, 11,625, of which 1,700 are colored.

CAMPBELL COUNTY.

ORGANIZED 1806. *County-seat, Jacksboro*—262,350 acres; value, $854,175; 607 farms; traversed by the precipitous and lofty Walden's Ridge, also by Powell's Valley, one of the most fertile in East Tennessee, producing well timothy, blue-grass, corn, and kindred crops; the mountains afford fine summer range for stock and produce superior fruit; improved farming land fifteen to twenty dollars per acre; water and water-powers well distributed; extensive deposits of coal and iron; coal mines opened at Careyville. The physical character of the county, upon the whole, is mountainous. There is a number of hills and ridges making through it in various places, and between them lie fertile valleys. Many of these hills and ridges are productive. The soil is rich, sometimes mixed with gravel, and well adapted to fruit, wheat and Irish potatoes. The soil of the valley is a dark mulatto in color, with a substantial clay subsoil. It is exceedingly tenacious, and will stand oppressive cultivation. Population, 7,445, of which 428 are colored.

*Only the number of acres assessed for taxation in each county is given.

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CARTER COUNTY.

ORGANIZED 1796. *County-seat, Elizabethton*—269,736 acres; value, $894,657; 527 farms; almost entirely in a mountainous region; the coves in the spurs of the mountains and the bottom lands along the Watauga and Doe rivers, only used for agricultural purposes. These bottom lands are very fertile and held as high as $100 per acre. A very superior car-wheel iron made in this county; mineral springs abundant; farms 50 to 100 acres, generally worked by owners; corn and wheat the staples; plenty of white pine, oak, poplar, hickory, walnut, maple and other timber; water and water-powers; county noted for magnificent scenery. Population, 7,909, of which 573 are colored.

CLAIBORNE COUNTY.

ORGANIZED 1801. *County-seat, Tuzwell*—195,867 acres; value, $768,419; 1,100 farms; surface—broad stretches of level land, abrupt highlands, and rolling land; Powell's river traverses the county from north-east to south-west, used during freshets to run out flat boats and rafts. North of Powell's river several distinct belts of land: 1. Part of Cumberland Table-land, soil poor. 2. Poor Valley, low, marshy and thin, mostly unfit for cultivation. 3. Poor Valley Ridge, also poor soil. 4. Walden's Ridge, then Powell's Valley, then a high table-land. Powell's Valley within this county is 400 feet above the river, but is very productive; celebrated Cumberland Gap in this county; abundance of timber, coal and iron, and a large vein of oxide of manganese. Lone Mountain appears in the southern part of the county. Its north-western face is covered with green fields and dense woods, in which the clambering vines, receiving sustenance from rich limestone soil, make the surface dark with their rank luxuriance. On the south-eastern side of the same mountain huge layers of sandstone sheet the surface in tilted masses, and the vegetation is sparse and the trees small and scraggy. With the exception of Powell's Valley and Sycamore bottoms, the whole country is high, rough and broken, for the most part fertile, but almost everywhere the tilted limestone rocks rise to the surface, forming glades and rendering the soil difficult of cultivation. Farms average only about thirty-five acres tillable land. Population in 1870, 9,321, of which 758 are colored.

COCKE COUNTY.

ORGANIZED 1797. *County-seat, Newport*—257,273 acres; value, $1,185,918; 1,509 farms; surface generally broken and mountainous. Principal valleys—French Broad on that river, about forty miles long in county and one mile wide, and Pigeon on Pigeon river, twenty miles long and one wide; both fertile. In corn from time immemorial; lands in these bottoms seldom for sale, other land ranges from five to fifty dollars per acre in price, and about the same proportion of productiveness; abundance and great varieties of fine timber and useful minerals; numerous water-powers. Population, 12,458, of which 1,274 are colored.

GRAINGER COUNTY.

ORGANIZED 1796. *County-seat, Rutledge*—178,935 acres; value, $1,284,128; 1,169 farms; surface marked by three parallel flutes or ridges—a miniature East Tennessee. The larger portion of the soil quite productive, even hill-sides produce corn, the staple of the county, well; county best adapted to grazing and breeding; well watered with springs and streams; abundance of timber. Bean's Station Valley is one of the most beautiful spots in the world. It is visited by large numbers of of persons in summer on account of its mineral waters. Price of land five to thirty dollars per acre. Population, 12,421, of which 1,030 are colored.

GREENE COUNTY.

ORGANIZED 1783. *County-seat, Greeneville*—324,143 acres; value, $2,609,144; 1,873 farms; surface distinguished by three belts; beginning at north-west side, the Lick

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creek country, six to eight miles wide, calcareous shale, adapted to wheat but has crawfishy spots; next a belt of hills along the Nolichucky river, very strong, productive soil; last the ridges of the Unaka Mountains. The Nolichucky, with its tributaries, supplies it well with water, and upon these streams are many fine alluvial bottoms. The water-power afforded by the Nolichucky is very valuable, the descent of the stream is very rapid, the banks solid and the bed rocky, abundance of limestone for the construction of dams being convenient and accessible. Railroad and river facilities for transportation; plenty of water and timber; bottom lands twenty-five to fifty dollars per acre; large deposits of iron ore and some zinc in Unaka Mountains. Population, 21,668, of which 2,064 are colored.

HAMBLEN COUNTY.

ORGANIZED 1870. *County-seat, Morristown*—101,687 acres; value, $1,165,988; lies partly in New Market Valley, which produces largely all the crops of this section, including blue-grass, timothy and clover; transportation facilities by rail and river; plenty of timber and water; limestone region; very little waste land in the county; plenty of land on the market at $5 to $100 per acre. One of the very best counties in East Tennessee. Population about 8,000

HAMILTON COUNTY.

ORGANIZED 1819. *County-seat, Chattanooga* 191,881 acres; value, $2,397,101; 850 farms; surface—almost parallel ridges and valleys, with north-east trend. Lookout Mountain terminates abruptly in Point Lookout near Chattanooga, where the Tennessee river, after traversing the county south-west fourteen miles, suddenly turns north-west. The Valley of the Tennessee, famous for its fertility, extends the whole length of the county, and with Lookout and Back Valleys affords the county an ample proportion of tillable land for corn, wheat, cotton, grasses, tobacco and other crops made here; plenty of timber for all purposes, and of great variety and excellence; limestone the prevailing rock in the valleys, sandstone on Cumberland Table-land and on Lookout Mountain; coal found in vast quantities and is extensively mined; iron ore exists in large deposits; valley lands eight to fifty dollars per acre, and plenty for sale. Chattanooga is one of the most important cities in the State, has river and very extensive railroad facilities. It has several large manufactories and is developing as rapidly if not more rapidly than any other city in the State. Population of the county about 23,000, more than half of which belong to Chattanooga, about one-fourth colored. Chattanooga already has direct railroad connections with all parts of the Union. By the Nashville and Chattanooga Railroad direct and through connections are made with St. Louis, Louisville, Chicago and Cincinnati. By the East Tennessee, Virginia and Georgia Railroad, Norfolk, Washington, Baltimore, Philadelphia and New York are reached by air-line. By the Western and Atlantic Railroad Chattanooga has direct connection, via Atlanta, with the sea-ports of the South Atlantic. By the Alabama and Chattanooga Railroad the most direct connection is made with New Orleans, Mobile and the other gulf ports. By the Memphis and Charleston Railroad direct connection is made with the Mississippi river, and with several important north and south railroad lines. By the St. Louis, Nashville and Chattanooga Railroad Line, Chattanooga has direct connection with the Northern Central Pacific Route, and by the Alabama and Chattanooga, and the Memphis and Charleston Railroads, direct connection with the different termini of the Southern Pacific Railroad. The Cincinnati Southern Railway, now in course of construction, has its southern terminus at Chattanooga. Other railroad connections have been surveyed, their construction being demanded by the rapid development of the country.

Seven steamboats are now engaged in the Tennessee river trade above Muscle Shoals. The upper Tennessee, and tributaries extending into Virginia and North Carolina, bring to Chattanooga large quantities of produce.

The following statistics, appertaining to the trade of Chattanooga for the year 1873, are as full as space will admit, and have been selected and prepared with care:

Local miscellaneous freights received at and shipped from Chattanooga, for the year 1873, not including grain, stock, iron, lumber, coal, cotton, nor hay:

Forwarded, pounds	97,444,469
Received, pounds	35,352,606

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THROUGH FREIGHTS.

From the north, pounds	552,645,661
From the east, pounds	82,424,297
From the south, pounds	46,462,395
From the west, pounds	66,411,500
Total	747,943,853

Produce and mineral products received at Chattanooga, from the upper Tennessee river and tributaries, for the year 1873:

Corn, bushels	609,266
Wheat, bushels	116,023
Oats, bushels	121,404
Hay, pounds	1,763,568
Bacon, pounds	1,717,058
Pig-iron, pounds	4,544,000
Coal, bushels	240,000
Saw-logs, number	10,500

Value of goods, wares and merchandise brought to Chattanooga for the trade of the city, for 1873:

Amount	$4,339,404

Distributed from Chattanooga over the Atlantic and Gulf States in 1873:

Horses and mules, number	13,380
Hogs and sheep, number	35,700
Cattle, number	9,640
Corn, bushels	2,538,325
Wheat, bushels	604,100
Oats, bushels	507,274
Flour, barrels	132,135
Hay, pounds	25,763 568
Bacon, pounds	62,753,000

Lumber shipped to the Northern and Eastern States from Chattanooga, 1873:

Number of car loads	864

Cotton shipped from and through Chattanooga, 1873:

To the east, number of bales	112,850
To the north, number of bales	2.997
To the south, number of bales	11,669
Total	127,516

Coal and coke received at Chattanooga, for consumption there, or re-shipment south, 1873:

Number of bushels coal	1,193,000
Number of bushels coke	150,000

Iron shipped from Chattanooga, 1873:

Pig, pounds	26,788,000
Merchant bar, pounds	5,772,373
Railroad, pounds	25,800,000

The cost of the production of pig-iron in the vicinity of Chattanooga, whether by hot or cold blast, and whether with charcoal or coke, ranges from fifteen to twenty dollars, the average being below eighteen. The result depends somewhat upon surroundings, but more on scientific knowledge and judicious management.

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The following shows the capital invested, value of machinery, value of products, and number of hands employed in manufacturing in Chattanooga in 1873:

Capital invested	$2,142,000
Value of machinery	1,060,500
Value of products	1,977,300
Number of hands employed	1,207

The following are some of the principal manufacturing establishments in Chattanooga:

Chattanooga Foundry and Machine Works. Very much enlarged within the last eight years, and is now one of the largest and most complete establishments of the kind in the South. It has a foundry of fifteen tons daily capacity.

Vulcan Works. This establishment has been in operation about eight years, and manufactures bar iron, bolts, hammered axles, fish-plate, wrought iron work for railroad bridges, and railroad forgings generally; also, light T rail for narrow gauge railroads, and rails for street railroads. There is a full supply of all the necessary machinery, together with five heating and puddling furnaces.

The Alabama and Chattanooga Railroad Machine Shops.

The Wason Car and Foundry Company have eight commodious brick buildings, well arranged for their several purposes.

Roane Iron Company. This company has two blast furnaces in operation on their mineral lands at Rockwood, with a capacity of fifty-five tons of pig-iron per day. The rolling-mill of this company, located at Chattanooga, manufactures railroad iron only. The rail mill is 80 by 650, and contains ten Dank's rotary puddling furnaces and five common puddling furnaces, nine heating furnaces, four trains of rolls, fifteen steam engines, from 25 to 300 horse-power, one Winslow's squeezer, one steam hammer, together with all the other machinery in use in first-class rolling-mills. Capacity, 100 tons railroad iron in twenty-four hours.

Chattanooga Iron Company. This company has erected the first blast furnace in the city limits since the war, and it is the only one now in the city. The blast stack is sixty feet high, iron shell, eighteen feet in diameter; diameter of bosh, thirteen feet four inches; 4 tuyers; cast house 36 by 65 feet, engine house 24 by 38 feet, boiler house 20 by 52 feet, stock house 50 by 200 feet; four boilers, length 50 feet, diameter, 32 inches; steam cylinder 32 by 48 inches; blowing cylinder 6 feet diameter, 4 feet stroke; draft stack 90 feet high, 50 inches inside; capacity of furnace, 30 tons pig-iron daily. The cost of material delivered will not exceed—

Ore, (over 50 per cent. metalic iron) per ton	$3 00
Limestone, per ton	1 00
Coke, per bushel	10⅔

Saw-mills, Planing-mills, etc. There are five steam saw-mills in the city, with capacity for the production of 40,000 feet of lumber per day. There are also five establishments for the manufacture of all kinds of dressed lumber, doors, sash, blinds, and every variety of house-finishing materials.

HANCOCK COUNTY.

ORGANIZED 1846. *County-seat, Sneedville*—112,570 acres; value, $474,995; 758 farms. This, one of the northern counties of the Valley of East Tennessee, has approximately the form of a right-angled triangle, the hypothenuse resting in part on the summit of Clinch Mountain, and the longer leg coinciding, for nearly thirty miles, with the Virginia line. It contains about 230 square miles. Surface—mountainous and broken, ridges and valleys running almost parallel, with north-east trend; several productive valleys in the county, most important of which is the Clinch Mountain Valley; limestone prevailing rock in the valleys; Clinch and Powell rivers navigable part of the year; no railroad facilities; abundance of timber, water and water-powers; great deal of land for sale at one to thirty dollars per acre; some iron ore is found in the county. Productions—corn, wheat, oats, sorghum, rye, hay and some tobacco; living is very cheap. Population in 1870, 7,148, of which 585 were colored.

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HAWKINS COUNTY.

ORGANIZED 1796. *County-seat, Rogersville*—288,986 acres; value, $2,027,727; 336 farms; surface—rich valleys and productive ridges; a portion of Clinch Mountain in northern part of county, and a portion of Bay's Mountain in southern part; Holston river with wide, rich bottom-lands traverses the entire county; all crops and fruits but the tropical produced well; abundance of yellow pine, poplar, walnut, oak, hickory, beech, cedar, and other timber; much attention to stock-raising and improving breeds; river and railroad facilities for transportation; the variegated marble found in immense quantities in this county, is quite famous; several useful minerals found in small deposits; mineral springs abound; plenty of water and water-powers; climate very healthy. Population, 15,837, 1,889 of which are colored. Price of land ranges from five to seventy-five dollars per acre. Rogersville has a population of 1,000; excellent society. The common schools are well established.

JAMES COUNTY.

ORGANIZED 1871. *County-seat, Ooltawah*—103,782 acres; value, $641, 010; traversed by the Savannah Valley, which has an average width of about three miles, and is quite fertile; farms are large and worked mainly by owners; railroad facilities; fair schools; plenty of timber and water; thinly settled; extensive beds of valuable fossiliferous iron ore. The prevailing rocks are limestones and dolomites. Sandstones and shales occur on White Oak Mountain, in which also are strata of the red fossiliferous iron ore. Mineral waters of various kinds abound. There is no lack of pure spring water, and no healthier region anywhere. The climate is mild. The winters are short, and the summer seasons are not oppressively warm. Population about 5,000, one-seventh of which are colored.

JEFFERSON COUNTY.

ORGANIZED 1792. *County-seat, Dandridge*—179,198 acres; value, $2.146,127; 1,410 farms; situated in the valley of East Tennessee, and noted for its superior lands; enterprising farmers; good schools; numerous churches, and good society; surface characterized by fertile, rounded ridges that swell into hills, and undulating valleys; limestone the prevailing rock; staples—corn, wheat, oats and hay; fine stock country; watered by the French Broad and Holston rivers, and Mossy creek; several flourishtng towns; healthful climate, in common with all East Tennessee; railroad facilities abundant; plenty of room for immigrants. Population, 19,476; colored, 2,910.

JOHNSON COUNTY.

ORGANIZED 1836. *County-seat, Taylorsville*—233,126 acres; value, $545,973; 601 farms; traversed by a long straight valley, trending northeast, on both sides of which rise mountain ranges; almost all the arable land in the county is in the valley. Johnson county is chiefly noted for its iron ore banks. Before the war some fifteen forges were in operation; one furnace now. The iron produced is very superior bar iron. County well watered by Watauga river, Roane creek, and South Fork of Laurel; no railroads; products varied, including cranberries; abundance of fine timber of great variety. This is the extreme north-eastern county of the State and belongs to the Unakas, of the natural divisions of the State. Population, 5,825, of which 418 are colored.

KNOX COUNTY.

ORGANIZED 1792. *County-seat, Knoxville*—290,579 acres; value, $4,359 947; 2,397 farms; total taxable property, $9,503,533; surface characterized by long staight ridges and valleys, traversing the the county in parallel from north-east to south-west; all the valleys differ in eoil, and each has its peculiar productions, or peculiar parts of the general staple productions of East Tennessee. The Tennessee or Holston and French Broad rivers, with their numerous tributary creeks within this county amply supply water, water-power and navigation facilities; Sinking creek, though small, furnishes excellent

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water-power; stock-raising and fruit-growing are among the leading agricultural pursuits of the county, for both of which there are special advantages; bottom lands improved are worth from $25 to $100 per acre; ridge lands from two to ten.

Knoxville was laid out in 1791, and has been ever since one of the leading towns of the State, being at present one of the most important cities in Tennessee, in point of population, commerce, manufactures, schools, railroad and river facilities. For not only is Knoxville the geographical and topographical center of Knox county, but it is also a commercial and trade center of a wide region, embracing nearly all East Tennessee, and large sections of south-east Kentucky, south-west Virginia, western North Carolina, and northern Georgia and Alabama. Ultimately the resources and connections of Knoxville must make it a great manufacturing center. The East Tennessee, Virginia and Georgia Railroad furnishes connection for the commerce of the north-eastern and south-western cities. The great cross route is already begun and its completion, in the nature of things, cannot be long delayed. That branch of it reaching out north-west is already built within easy connection within any possible line of the Cincinnati Southern road, while it points directly through Louisville to Chicago. Other lines must be opened in time, connecting Knoxville more directly with Nashville and the east. These will not be speculative lines, but lines of real worth, built in response to urgent demands and supported by actual commerce.

The following examples will indicate the importance of the city's trade:

The poultry trade has grown to great porportions and is most systematically established. The rapid development of this trade is better illustrated by the following table of the annual shipment for 1871-2-3, as given by the East Tennessee, Virginia and Georgia Railroad:

	1871.	1872.	1874.
Eggs	20,500 lbs.	112,409 lbs.	218,301 lbs.
Feathers	70,734 lbs.	110,009 lbs.	108,837 lbs.

For the past two years there have been 25,000 pounds of butter shipped from Knoxville per annum.

Of manufacturing establishments, there are two foundries, one machine shop, one car-wheel manufactory, one rolling mill, and one nail manufactory. Of wood manufactories, there are three sash and blind manufactories, two saw mills, one saddle-tree manufactory, two furniture manufactories, one wagon and carriage manufactory, and one keg manufactory, besides some smaller establishments. There are three flouring mills, two saddle and harness manufactories, one tannery, one broom manufactory &c. The iron establishments draw their raw material from the iron and coal mines opened at different points in East Tennessee—coal from Anderson and Campbell counties, and iron from Greene, Washington and Carter counties; the wood manufactories from various points in East Tennessee along the line of the railroads and rivers. In all their departments these manufacturing establishments employ 1,200 hands, perhaps, wages ranging from one dollar per day for common laborers to four dollars and fifty cents for skilled laborers. The wholesale trade will approximate: dry goods, notions, &c., $3,000,000; drugs, $250,000; groceries, $350,000; hardware, $300,000. These sales are made in South-eastern Kentucky, South-western Virginia, Western North Carolina, Northern Georgia, North Alabama and East Tennessee, covering a large territory, as will be seen upon examination of the maps of these States, of which Knoxville is the center. This trade is increasing rapidly and constantly. Approximate number of houses built, all classes, dwellings and business houses within the past two years, five hundred. Average wages for unskilled labor $1 to $2.50 per day, skilled $3 to $4.50. Average retail price of bacon, 12½ cents per pound, beef 8 cents, mutton 8 cents, flour 4 cents, meal 65 cents per bushel, sugar 12½cents per pound, coffee 22 to 30 cents. Average house rent, say eight to ten per cent. of value of property rented. Comfortable houses, four to five rooms, $12 to $20 per month, according to location.

The timber trees of the county are such as are common to what we have called the valley division in speaking of the timber of East Tennessee. The number of the creeks in the county and the amount of river bottoms give an extra quantity of the yellow poplar, white oak and other trees growing in the richer lands, while considerable yellow pine is mixed with the oaks, hickories, ashes, and elms that cover the ridges. The lumber trade of Knoxville is rapidly increasing, mainly in such as is used in house-building. The prices for lumber at the yards average about as follows: Pine, poplar, hickory, oak,

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and ash $15, and walnut, $30 per thousand feet. The supply of the first four is practically unlimited, but both good ash and walnut are hard to get. The hickory is extra fine, and large quantities are manufactured into wheel-spokes, pick and axe-handles. Recently a considerable trade has been opened in shipping yellow poplar plank to Boston, and there is every reason to anticipate a large increase in this trade. The cost of shipment is $13 per thousand feet. For cabinet-making, lumber is bought dry, ready for use, at about the following prices per thousand feet: Ash, beech, cherry, hackberry, poplar, sweet gum and sycamore $22, cherry $25, walnut $45. Our quotations are all for first-class lumber.

The marble trade of Knoxville is rapidly increasing. The East Tennessee University, with which is the State Agricultural College, one of the oldest, largest, and best equipped in every respect, in the South, occupies a beautiful eminence within Knoxville proper. The public schools are successfully established, and working most satisfactory. Population of county, 28,990, of which 4,840 are colored.

LOUDON COUNTY.

ORGANIZED 1870. *County-seat, Loudon*—137,933 acres; value, $1,484,372; total taxable property, $1,972,252. Population about 7,500, one-seventh colored. The larger portion of this county is very productive; the county is traversed by the Tennessee river, tributary to which within the county are Sweetwater, Pond, Fork and Town creeks, and the respective valleys of each of these streams are very fertile; the farms are large and well tilled by improved methods; 350,000 bushels of grain shipped annually; ample railroad and river facilities; numerous water-powers; county is out of debt; has fine public buildings, and is in a very prosperous condition. Stock-raising is greatly on the increase; horses, mules, hogs and cattle, as well as other kinds of stock, are being raised for market, but mules and cattle are principally looked to as a source of revenue at the present time. The prevailing rock is limestone, and every species of timber abounds. There is a cotton factory situated on Town creek, at Lenoir's, that employs twenty-five operatives.

MARION COUNTY.

ORGANIZED 1817. *County-seat, Jasper*—Acres assessed 274,631; value, $1,103,430; total taxable property, $1,263,199; lies partly on Cumberland Table-land, and partly in Sequatchie valley; the soil in the latter is limestone, highly productive, though much worn. On the Table-land, soil sandstone, thin, furnishes fine highland pasturage. Coal and iron ore exist in large quantities, the former mined to the amount of 500,000 bushels annually. Staple crops: corn, wheat, oats and potatoes; soil well adapted to tobacco and hay; best land forty dollars per acre; medium twenty dollars; mountain land from fifty cents to five dollars; the county is well watered by the Tennessee river, Big and Little Sequatchie rivers and Battle creek; the Tennessee river is navigrble and furnishes a good outlet; a railroad runs from Jasper to Bridgeport, Alabama, uniting with the Nashville and Chattanooga Railroad. Population, 6,841, 915 colored.

McMINN COUNTY.

ORGANIZED 1819. *County-seat, Athens*—Acres assessed, 270,249; value, $2,066,817; total taxable property, $2,754,273; lies partly in the Valley of East Tennessee, traversed from north-east to south-west by six large creeks; the Hiwassee river forms the south-west boundary of the county; water-power abundant and valuable; soil limestone, alluvial and cherty, two former very productive; best lands eighty dollars per acre; second class from twenty-five to fifty dollars per acre, according to location; third class from one to ten dollars; timber: oak, chestnut, walnut, locust, hickory and pine; staple products: corn, wheat, oats. rye, grasses, clover; the soil grows tobacco well; educational advantages good; no county debt. Athens has a population of 1,000 and is noted for its excellent society.

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MEIGS COUNTY.

ORGANIZED 1835? *County-seat, Decatur*—Acres assessed, 129,144; value, $1,072,322; total taxable property, $1,148,930; the Tennessee river passes through the county and runs north-east and south-west; it is the only channel of transportation; the Hiwassee river runs from east to west and is floatable; river and creek bottoms extensive and productive; the county lies wholly in the Valley of East Tennessee; soil calcareous, fertile except on ridges; bottom lands on Tennessee river, best $100 per acre; medium $75; best uplands $40; inferior from one to ten dollars; corn, wheat, oats, potatoes and sorghum principal crops; timber as in McMinn; Chattanooga principal market; large quantities of corn shipped from county. Population, 4,511, of which 436 are colored.

MONROE COUNTY.

ORGANIZED 1819. *County-seat, Madisonville*—Acres assessed 444,913; value, $1,878,-973; total taxable property $2,304,291; one of the border counties, lying next to North Carolina; southern portion high, mountainous, rough, unfit for farming purposes; northern part lies in the valley of East Tennessee; ridgy, with productive valleys; Sweetwater Valley is one of the most charming in the State; almost every variety of soil is represented in this county; large deposits of iron ore exist; products and timber very much as in Carter; improved lands are worth from seven to fifty dollars per acre; the East Tennessee, Virgina and Georgia Railroad passes through the county; Tennessee and Tellico rivers furnish transportation by water; water-power is abundant and valuable. Population in 1870, 12,589, 1,235 colored. Madisonville has a population of 350.

MORGAN COUNTY.

ORGANIZED 1817. *County-seat, Wartburg*—Lies on the Cumberland Table-land; soil sandstone, thin and unproductive of the cereals; well adapted to fruit, Irish potatoes and garden vegetables; highway pasturage good; lands cheap, ranging in price from fifty cents for wild to twenty dollars for best improved; timber on slopes excellent; some German emigrants have settled in the county; the Cincinnati Southern Railroad will pass through the county; acres assessed 803,258; value, $352,515; total taxable property, $398,081; coal abundant but not worked; water-power good.

POLK COUNTY.

ORGANIZED 1839. *County-seat, Benton*—Occupies the extreme south-east corner of the State; the surface is rough, broken and sometimes mountainous; there are a few rich valleys that produce wheat, corn, oats in generous quantities; much of this land in the county has been sadly worn by bad tillage; the Ocoee, a rapid, roaring streams, sweeps through the county in raging torrents, descending a thousand feet in twenty miles; copper abounds in this county, and a large amount of capital is invested in the reduction of the ore; acres assessed 253,510; valued at $975,454; total taxable property $1,220,-470; land: improved, from three to twenty dollars per acre. Population in 1870, 9,369, 313 colored.

RHEA COUNTY.

ORGANIZED 1807. *County-seat, Washington*—Acres assessed 202,691; valued at $969, 836; total taxable property, $1,123,570; the area of Rhea county is divided between the Valley of East Tennessee and the Cumberland Table-land; its north-western boundary rests on Walden's Ridge, this plateau ridge being divided about equally between Rhea and Bledsoe; its south-eastern boundary is the Tennessee river, which separates it from Meigs; on the north-east it is bounded by Roane county, and on the south-west by Hamilton; between Walden's Ridge and a series of broken knobs parallel with it, is a long valley running the entire length of the county, which constitutes a part of a great valley extending through the State, and closely hugging the eastern escarpment of the Table-land; the Tennessee river meanders through rich alluvial bottoms; White's

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creek, Muddy creek, Piney river, Town creek, Wolf creek, Clear creek, Yellow creek, Big and Little Richland, and Sale creek, thread various portions of it; the soil on the Cumberland Table-land is sandstone and thin, that in the river valley alluvial, and in the subordinate valleys clayey and calcareous; the price of the first per acre varies from one to five dollars, of the second from twenty-five to one hundred, of the third from ten to fifty dollars; production same as in Meigs. Population in 1870, 5,528, colored 531.

ROANE COUNTY.

ORGANIZED 1801. *County-seat, Kingston*—Acres assessed 212,789; valued at $1,770,-129; total taxable property, $2,210,961; topographically this county is very much like Rhea; price of land about the same; iron ore and coal are abundant, and several well appointed furnaces are in operation; one for making charcoal iron has lately been erected at Kingston; marble both white and variegated exists in great abundance; the county is watered by the Tennessee, and its tributaries, the Clinch and Emory rivers, the last of which are navigable about eight months in the year, the first all the year; Rockwood, five miles from Tennessee river, is an important manufacturing town, two blast furnaces being at that point; timber is in great plenty and of valuable kinds, such as pine, poplar, walnut and oak; coal is extensively mined at several points; limestone is abundant in the valleys, sandstone on the mountain; oak is the prevailing timber, though east of Kingston are pine forests; poplar and walnut are also found. Population in 1870, 15,622, of which 2,128 were colored. Kingston, the county-seat, offers facilities equal to Chattanooga for manufacturing.

SCOTT COUNTY.

ORGANIZED 1849. *County-seat, Huntsville*—Acres assessed 387,831; value, $236,187; total taxable property, $266,943; improved lands five dollars per acre, unimproved from fifty cents to three dollars; it has a sparse population; the strips of land lying along the streams produce well; sheep-husbandry and fruit-growing would pay largely; magnificent forests of valuable timber and its large coal resources will be developed upon the completion of the Cincinnati Southern Railroad, which will pass through the county. By reference to the map of Tennessee it will be seen that it is one of the extreme northern counties of East Tennessee. It lies on the Cumberland Table-land, and possesses all the characteristics of that region. The only lands that are valueable lie upon the creeks, and these are narrowed down to small strips. Population in 1870, 4,054, colored 39.

SEQUATCHIE COUNTY.

ORGANIZED 1857. *County-seat, Dunlap*—Acres assessed 131,258; valued at $296, 832; total taxable property $347,526. Population, 2,335, 175 colored. This county is traversed by Sequatchie Valley, which divides it naturally into three strips or belts—the south-eastern portion being on Walden's Ridge, the central being in Sequatchie Valley, and the north-western on the Table-land; the first and third portions have about the same elevations, while the central or valley portion is not far from being one thousand feet lower, and is the only cultivated part of the county. This is walled in by the escarpments of the Table-land on the one side, and Walden's Ridge on the other; it has only one natural outlet, and that is south-west to the town of Jasper, the capital of Marion county, where a branch of the Nashville and Chattanooga Railroad is reached; iron ore and coal are abundant and easily mined; the lands in the Sequatchie Valley are very valuable and command high prices, running from twenty-five to fifty dollars; the soil in the valley is limestone, on the Table-land and on Walden's Ridge the soil is sandstone, and the land cheap, ranging from one dollar to five; timber in the valley consists of oak, hickory, walnut, maple, beech, &c., on the Table-land chestnut abounds.

SEVIER COUNTY.

ORGANIZED 1795. *County-seat, Sevierville*—Number of acres assessed 549,059; value, $1,377,867; total taxable property, $1,593,648; contains much valuable land; exten-

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sive banks of iron ore undeveloped, with some other minerals; much fine land for agriculture and stock-raising; immigration and capital can make the great area of this county rich and flourishing; the surface of this county is generally mountainous; there is a belt of limestone land several miles wide that passes through the county that is very fertile, another belt passes south of Sevierville; the valleys on Little Pigeon and French Broad rivers are very fertile; the knob-land of which there is a considerable quantity is very productive; there are five valleys or coves in Sevier county; Wear's Cove is the most noted, it is about five miles long and three miles wide, the mountains wall it on both sides; the coves next to the Unaka Mountains are very rich; they afford a range sufficient for thousands of cattle from the 1st April to the 15th of November; corn, wheat and oats are the staple crops; stock-raising is carried on to some extent; water-power is good. Population, 11,028, 283 colored.

SULLIVAN COUNTY.

ORGANIZED 1779. *County-seat, Blountville*—Acres assessed 237,271; valued at $1,819,856; total taxable property, $2,394,472. Bristol on the State line at the terminus of the East Tennessee, Virginia and Georgia Railroad is a flourishing town; the above road, a link in the Great Eastern Air Line passes through the county; there are several flourishing towns on this route within the county; the county contains a large area of fine grass and wheat lands; the stock of the county is above an average; the prevailing rock is limestone; occasionally, on the ridges, sandstone and flint, the principal mineral is iron, and that is in great abundance and of the best quality; at one time there were eight iron manufactories in operation, besides founderies for making hollow-ware; there only two now in blast; the soil of Sullivan county is based mostly upon a solid clay sub-soil, and is susceptible of great improvement and well adapted to all the grasses; there is a great deal of what is termed *mulatto* soil of a dark reddish color, and is regarded as the best wheat land in the county; land varies in price from two to fifty dollars per acre; the prevailing timber is oak, poplar, ash, walnut, chestnut, beech and yellow pine; productions: wheat, corn, oats, sorghum and buckwheat. Population, 13,136, 857 colored.

UNION COUNTY.

ORGANIZED 1856. *County-seat, Maynardville*—Acres assessed 98,475; valued at $734,093. Population 7,605, of which 214 are colored. Improved lands worth about ten dollars per acre, unimproved five dollars. The valleys are Big Valley, Hickory Valley, Hind's Valley. Raccoon Valley, Bull Run Valley, and Flat Creek Valley, the most noted of which are Big Valley, Hickory Valley, Raccoon Valley and Flat Creek Valley; their average fertility, under such culture as is usually bestowed by the farmers of this county, is about thirty bushels of corn or oats, and about ten bushels of wheat to the acre; other crops in proportion; the ridge and mountain lands are scarcely fit for anything except it be for raising fruit and grazing sheep; the principal crops grown are corn, wheat, oats, rye potatoes, cotton, tobacco, sorghum, etc. Nearly one-tenth of the land is devoted to grass, one-half of which is mown and the remainder is pastured; one-fourth is clovered, which is mostly pastured; the principal rocks are limestone; the prevailing timber is poplar, pine, oak, chestnut, etc., of which there is a great abundance; water-courses suitable for manufacturing purposes are, Lost creek, Little Barren, Miller's creek, Crooked creek, Fall creek, Bull Run, Hind's creek, Dotson creek and Flat creek; any of these will afford power sufficient for any kind of machinery; besides these, there are some smaller ones suitable for light machinery, such as carding machines, cotton gins, etc. Clinch and Powell's rivers run through the county. The value of taxable property is $843,014; no railroads; facilities for transportation not good; iron ore is found in great quantities; the county is well adapted for sheep-raising. Ample room for immigrants.

WASHINGTON COUNTY.

ORGANIZED 1777. *County-seat, Jonesboro*—Area 430 square miles; acres assessed 304,736; valued at $2,270,033; total taxable property, $2,709,541. Population 16,317,

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colored 1,614. The southern part is very mountainous, some of the peaks rising over six thousand feet above tide water. Several beautiful coves, among others, Greasy Cove and Bompass Cove lie in the mountains, the soils of which are very productive; in these coves are found valuable iron deposits. The Watauga washes the north-eastern boundary, and the Nolichucky by deep canyons cuts the Unakas at right angles. The soil on the north part of the county is calcareous and cherty, with occasional outcroppings of gray shale, and is fertile and durable; improved lands are worth from twenty to thirty dollars per acre in the best portions of the county; the mountain lands are cheap, ranging from fifty cents to two dollars per acre. Besides iron ore, lead and barytes are met with; the county is heavily timbered with oak, walnut, beech, poplar, wild cherry, hickory and ash. Productions: corn, wheat, oats, buckwheat, potatoes and flax. The public schools are among the best in the State.

MIDDLE TENNESSEE

Middle Tennessee is by far the most populous division of the State. It embraces forty counties and has a superficial area of 18,000 square miles, and a population, according to the last census, of 561,832, of which 157,122, were colored. The value of its taxable property in 1873, was $136,906,579; number of polls, 80,858; number of voters, 109,796. It contains 145 towns and villages. It has 550 miles of railway, and nearly 500 miles of navigable rivers. The surface is greatly diversified, and exhibits varieties of scenery the most opposite. Passing from Grundy to Wayne, or diagonally from Stewart to Franklin, one sees almost every variety of landscape and surface features—mountainous, with rushing torrents and foaming cataracts; hilly, with swift, smoothly gliding streams; level, where the waters linger by the sides of green pastures and grassy meadows, and where luxuriant crops gladden the face of nature. There is indeed no fairer region than that of Middle Tennessee. Nature has been lavish of her gifts of soil, of minerals, of timber and of water, of beauty in the landscape and freshness in the air; of health for the body and mind and freedom from inclemencies of season. There is not a swamp properly, so called, within its boundaries. Its drainage is almost perfect. The surface is slightly tilted toward the north-west, and through deep gorges in the Highlands, the Cumberland, Duck and Elk rivers flow on to mingle their waters with those of the Mississippi. There are altogether, more than 300 milling streams in this division, over fifty macadamized roads, and good schools and churches in every neighborhood. One peculiarity is noticeable about Middle Tennessee, and that is its great variety of productions. No crop can be named, that grows above the 35th parallel, that does not mature in some portion of this division. Tobacco, corn, clover, wheat, barley, rye, cotton, peanuts, all the grasses, vegetables of every kind, melons of the finest flavor and size, fruits, such as grapes, peaches, pears, apples, quinces, apricots, plums, cherries, strawberries, dewberries, raspberries, gooseberries, attain each such a

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perfection as to be noticeable. The climate is such as to permit the introduction of the fig and magnolia. And further, nearly every product ripens most opportunely, and can always be put upon a bare market. Wheat and fruit and all the vegetables can be put in the Chicago or New York markets three weeks before they ripen in that latitude. The extent, variety and excellence of the timber is another marked feature of this division. Nowhere else are there such forests of red cedar, while the ash, poplar, cherry, sugar tree, the oaks and hickories, are found everywhere. The white oak is said to be superior to any found in America. Nowhere in America are seen so much valuable fencing material. For in addition to the cedar and chestnut timber, which make the best rails in the world, there is an unlimited amount of the finest building stone, of which cheap and durable enclosures may be constructed. Within the same limits there is no country in which is found such a variety of soils of such excellent qualities and of such adaptabilities.

The soils of this division though thin on the Cumberland Tableland and in the barrens of the Highlands, are rich, mellow and highly productive, and will yield generously to kind treatment and good culture.

In relation to the mineral wealth in this division, the iron ore on the west covering 4,000 square miles, is balanced by the stone coal on the east. As to the quantity of these two minerals, there is practically no limit. Since 1810 the iron ore has been worked, and we have no reason for believing that it will not be worked a thousand years hence.

As a manufacturing region, time will develop its eminent advantages. The aggregate amount of unoccupied water-power is enough to work up annually the entire cotton crop of America. Cheap coal is attainable from three points—from our own coal fields, from the upper Cumberland, and from the western coal fields of Kentucky.

Stock. There is no surer method of estimating the wealth and solidity of a farming community, than by the number and excellence of its domestic animals. Middle Tennessee, and especially that portion included within what is called the Central Basin, has probably as much fine stock as all the cotton states put together. For three-quarters of a century, Tennessee horses have been famous. On the turf and in the more useful labors of the farm and on the field of battle, their spirit of endurance has given them a character unsurpassed. Tennessee mules, for the two past decades, have cultivated the cotton fields of the South. Cattle of every breed from the lordly shorthorn to the deer-shaped Ayrshire, are seen grazing upon every hill, and the central part of this middle division is acquiring an enviable fame. From Indiana and Illinois, Ohio and Missouri buyers come to this State in search of the most perfect types of every animal. One noted for his sagacity in stock-breeding, recently declared that the Central Basin was the finest region for growing cattle he had ever seen. With a spontaneous growth of blue-grass, there is united a well watered fertile region, in a mild climate and one whose health-

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fulness for stock is unsurpassed. The richest countries in the world are the cattle countries, and one may well determine the value of land by the price of the cattle. Every well-informed man knows that the quality of wool made in Tennessee has elicited the admiration of the whole world. The late Mark Cockrill used to declare that every agency is here united to make the very finest fleece, and he had the satisfaction of demonstrating it to the assembled wool-growers of the world.

Farms and Farmers. The attentive reader will not have failed to observe that the main topographical feature of Middle Tennessee consists of a grand terrace covering 9,300 square miles, which circularly rims the great limestone basin which we have called the Central Basin, and which covers 5,450 square miles. This basin is the fairest agricultural region in the United States, south of the thirty-sixth parallel, and the character of the soil, the style, finish and elegance of the farm-houses, and the general beauty of the country, depending not upon any general feature, but the combined result of hill and dale, wood and stream, meadow and field, mingled into a thousand delightful landscapes, everywhere set off this Basin and make it an extended panorama of exquisite rural elegance and beauty. In it are found the very best farmers in the State, who bring to their vocation the appliances of improved machinery and all other agencies that a cultivated intellect would suggest. As a usual rule rotation is practiced, though not to the same extent as before the war. The soil is well prepared by deep plowing and sub-soiling, and the crops are usually well cultivated, except in those localities where the pernicious system of cropping prevails. Labor is scarce and not reliable, and as a general thing the farms are too large and were arranged to suit the old plantation system, which under the new regime has ceased to be profitable. Lands in the Central Basin are high, the best improved farms ranging from thirty to one hundred dollars per acre. And there is one singular fact connected herewith. Remote from railroads, lands in this Basin have not greatly depreciated in price, while in the more populous counties, such as Maury, Davidson, Sumner and Rutherford, they have fallen since the war at least forty per cent. In Cannon, Smith and Marshall counties and portions of Bedford, lands are in moderately active demand at high prices. There is but one way to account for this phenomenon. The high rate of interest money bears, and the frequent opportunities offered for investment in the first named counties, have directed the minds of many farmers from their legitimate business, and they prefer the more quiet work of clipping off coupons to the troublesome and constant attention necessary to insure success on their farms. Hence many farms are for sale, and the competition among sellers has reduced the price of land.

On the Highlands, and especially in Montgomery, Robertson, Stewart, Warren and Franklin, the character of the farms and farmers is much the same as in the Central Basin. In the first three named, tobacco is largely grown, and no land in the State grows wheat so kindly

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or so well. The Highlands are probably also better suited for fruits than any land in the State, except the Cumberland Table-land. In proportion to productive capacity, there are probably no lands in the State that rate lower in price than those in Montgomery, Stewart and the other counties of the Highland rim.

In respect to health, the Highlands will compare favorably with any portion of the American continent. No epidemic has ever prevailed, and as the forests are swept away by the demands of domestic life, even fevers, (which were once prevalent,) by reason of the climatic changes wrought are becoming uncommon. There is really no epidemic disease, and when the Central Basin is sometimes unfortunately visited by cholera, the citizens flee to the Highlands, with an assurance of perfect immunity from that dread disease.

In the northern tier of counties on the Highlands, ice-houses are very common, and almost every farmer either has one or an interest in one. Spring and well water is abundant, though many prefer cisterns. In the Central Basin spring water is very generally used. The prevalence of limestone makes the digging of wells or cisterns expensive and difficult. With the exception of a very few localities, stock-water is abundant throughout Middle Tennessee.

The climate is equable and mild. Observations for twenty-one years show that the temperature has not gone above 99°, while the lowest has been 8° below zero. The mean summer temperature is 75°—annual mean58°. The average of low temperature for twenty-one years is 2.6°. The number of days between killing frosts is 189, and the average amount of rainfall forty-six inches. Winter rarely lasts over seventy-five days, and snows, though occurring often during winter, soon disappear. In general, the climate, on equal latitudes, is two degrees hotter than in East Tennessee and two degrees cooler than in West Tennessee. During some winters stock is able to subsist throughout the season upon grasses and especially is this the case in protected situations.

Mineral springs of excellent water are found scattered all over Middle Tennessee. The most noted are upon the Highlands and upon the Cumberland Table-land. The spring region of Middle Tennessee is becoming justly famous, not only on account of the water, but for the beauty of the landscape and purity of the atmosphere. Especially is this the case with the portion upon the Table-land. The magic influence of the mountain air and the healing virtues of the water, impregnated as it is with salts of iron, have restored many a dyspeptic to vigorous health, and given fresh vitality to many a frame worn down with overwork, confinement and anxiety,

As to educational facilities, no portion of the South is better provided than the best portions of Middle Tennessee. And the probabilities now are that it will become the great educational center of the Mississippi Valley. Several first-class Universities are now being established with endowments ranging from $100,000 to $1,000,000. A generous rivalry is springing up between the different religious denominations, and Mid-

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dle Tennessee is gathering into her lap contributions from almost every State in the Union for the benefit of her educational institutions.

We should probably be remiss in our duty not to say that immigrants would be warmly welcomed. In no portion of the United States could they do better. Industry is here sure of its reward. Thousands of acres of good land can be bought at reasonable prices on the Highlands and in the Basin. Much of the land on the Highlands is thin and unproductive, except for fruit, and may be bought for two and three dollars per acre. Wherever a red sub-soil prevails, the original surface soil is good. Many such spots occur in basin-like depressions and constitute as valuable land as can be found in the State.

BEDFORD COUNTY.

ORGANIZED 1809. *County-seat, Shelbyville*—Population in 1870, 24,333, of which 6,484 were colored; taxable property in 1873, $7,104,965; number of acres assessed, 293,333, valued at $5,295,952. The county lies in the Central Basin; its surface is rolling with occasional flat-topped hills; the soil is rich, and the whole county is exceedingly well watered; Duck river flows from east to west a little south of the center of the county; the tributaries which enter it from the north are Spring creek, North Fork, Garrison Fork, with its tributary Wartrace creek; Barren Fork may be considered the main stream, but the name of Duck river is not affixed to it until after its junction with Garrison Fork; the tributaries from the south are Sinking creek, Big Flat creek, Thompson's creek, besides many smaller streams; there is scarcely a farm in the county that does not have one or more springs of pure limestone water; limestone is the prevailing rock; the soil is calcareous and highly productive; the timber is ash, poplar, walnut, butternut, elm, red-bud, sumac, dogwood, black gum, and extensive forests of red cedar, covering in the aggregate ninety square miles; fences are built mostly of cedar rails. Productions: corn, wheat, oats, rye, blue-grass, timothy, herds-grass, German millet, Hungarian grass, and in the north-eastern part of the county, cotton. Stock-raising is carried on extensively, many mules are shipped south. The blue-grass lands cover one-half the surface of the county. The smaller industries claim a good share of attention. Cotton is manufactured to some extent. Lands are worth from ten to eighty dollars per acre—very little for sale. The farms are in a high state of cultivation; amount of negro labor employed inconsiderable. Nashville and Chattanooga Railroad furnishes ample facilities for the shipment of produce. Towns and villages are Shelbyville, Bellbuckle, Unionville, Richmond, Flat creek, Normandy, Fairfield, Palmetto, Hawthorne, Rover, Fall creek, Haley's Station and Bedford. No minerals of importance. In agriculture it is not surpassed by any county in the State.

CANNON COUNTY.

ORGANIZED 1836. *County-seat, Woodbury*—Population in 1870, 10,502, of which 927 were colored; acres of land assessed, 160,013; valued at $1,452,220; total value of taxable property, $1,669,240. More than half of this county lies in the Central Basin, and the remainder, or eastern and southern edge, on the Highland Rim. Spurs shoot out from the Highlands into the valley, one of which, in the northern part of the county, extends nearly through it, from east to west, and forms the water-shed between the streams that enter directly into the Cumberland, and those which flow in an opposite direction into Stone's river. From the north, beginning on the east, Stone's river is fed by Rockhouse, Carpenter's, Rush and Lock creeks; from the south, Hill's creek, Hollis' creek and Brawley's Fork, the latter having several tributaries known as Espy's Cave, Horse Spring Fork and Burgess creek, the three making Carson's Fork, which empties into

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Brawley's Fork, one-half mile south of the Woodbury and Murfreesboro Turnpike, and the latter into Stone's river, five miles west of the county-seat. Barren Fork of Collins river, rises on the Highlands, which form the eastern edge of the county, and flows east into Warren county. Nearly all these streams supply good water-power. Stone's river, by reason of its swiftness and constancy, and volume of water is especially suited for milling purposes. The soils, on the Highlands, are light colored, sometimes of a pale yellow, often blue and occasionally red. These soils for the most part, are thin and unproductive, occupying level areas, and covered with a rank barren grass which affords good summer grazing. Fruits, herds-grass and tobacco grow well upon the Highlands, but these soils are not well suited for general farming. The soil of the part lying in the Central Basin is rich and the lands rolling. Productions: corn, wheat, oats, hay, live stock, and in the western part of the county, cotton. Lands are worth in the best parts of the county from twenty to sixty dollars; on the Highlands from two to ten; not much for sale; the county resembles Bedford in all except the cedar forests of the latter.

CHEATHAM COUNTY.

ORGANIZED 1856. *County-seat, Ashland*—It lies below Nashville on both sides of the Cumberland river, and belongs to the Highland Rim; the soils on the uplands is siliceous and calcareous. For the most part, the face of the county is hilly. Adjoining Robertson and Montgomery counties, the hill-land is quite productive, yielding well corn, wheat, oats and tobacco; while the valleys contiguous to the Sycamore, Half Pone and Barton's creeks, are rich and produce fine crops. The north side of the river is mostly broken and the hill-land valuable only for the timber. The Marrowbone creek bottoms are not so productive as those on the streams already mentioned. On the south of Cumberland, the land on Harpeth river is exceedingly fertile, and on Sam's and Brush creeks is good. The greater portion of the county on the south side is hilly and almost mountainous. Sycamore creek, also on the north side of the Cumberland river, affords a good and constant supply of water. A large powder mill is in operation on this stream, with a capacity of 240 kegs of blasting, or 3,000 pounds of sporting powder per day. This stream runs deeply below the general level of the country; its average depth being 140 feet. It falls rapidly and affords many valuable mill sites. Harpeth river and its tributaries on the south side of the Cumberland, have valuable water-power. On Harpeth is a very valuable one, known as the "Narrows of Harpeth." Iron ore exists in the county yielding from furnace about 45 per cent.

Hill-land unimproved, sells from three to five dollars per acre. Improved land can be bought at from ten to fifty dollars per acre. Corn, wheat, tobacco, peanuts, oats, hay, and rye are the principal productions. Timber is plentiful. Facilities for transportation furnished by the Cumberland river and by the Nashville and Northwestern Railroad. Population in 1870, 6,678, of which 1,470 were colored. Acres assessed, 182,287; valued at $990,708; total value of taxable property, $1,154,108.

CLAY COUNTY.

ORGANIZED 1870. *County-seat, Celina*—Population about 6,000; acres assessed, 124,933; valued at $661,061; total value of taxable property, $763,615. The county is nearly a parallelogram, forty miles in length from east to west, by twelve miles wide. In order to facilitate a correct understanding of its topography, it is best first to imagine a plain of the above dimensions, with a moderately undulating surface, nearly level in the west. Then imagine the middle of this plain cut diagonally across from north-east to south-west by a valley of irregular outline nearly 600 feet deep, and averaging a little more than one mile in breadth between the bases of the opposite hills. This is the valley of Cumberland river. Opening into it on the east side near the center of the county, is the long, winding valley of Obey's river, with a general direction from east to west. A number of smaller creeks emptying into these two rivers, have valleys of their own, extending outward, and separated from each other by ridges or fingers of the plain to which the general surface of the county has been referred. These ridges and the intervales may be compared to the teeth of a saw, broad at the base and growing gradually narrowed toward the apex. Some of the valleys have branches ramifying back among the Highlands and breaking the surface of the plain irregularly. The extremi-

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ties of some of the ridges have been cut off, leaving isolated knobs standing out in the valleys. The soil except in the creek and and river basins is a rich dark loam, with a red clay sub-soil; the timber consists of hickory, beech, sugar, maple, and dogwood on the hill-sides and hollows; on the hills, oak and chestnut predominate. Productions: corn, tobacco, clover and grass, wheat, oats, rye and potatoes. Much attention is paid to the raising of live stock. Improved farms on the upland can be bought at from five to ten dollars per acre; from twenty to fifty dollars in the valley. Cumberland river which passes through the county is navigable for steamboats about seven months in the year; Obey river is also navigable for three months. Iron ore and petroleum are found in various portions of the county.

COFFEE COUNTY.

ORGANIZED 1836. *County-seat, Manchester*—Forms part of the Highland Rim, a small portion of the county around Beech Grove being in the Central Basin; the lands around Beech Grove are not surpassed in fertility by any land in the State; the country is beautifully diversified with hill and valley, abounding in springs of pure water; the soil is admirably adapted to the production of corn, wheat, rye, barley, oats, hemp, clover, timothy, herdsgrass and orchards grass; on the Highlands tobacco grows well, but the cereals are not as prolific as on the lands in the Basin; the timber in the Basin is beech, oak, sugar tree, elm, ash, hackberry, black walnut, white walnut, cherry, mulberry, yellow poplar, pawpaw, black locust, honey locust, buckeye, linn, white and black haw; on the upland or "barrens" blackjack and hickory are the most common growth. Land in the "barrens" is cheap, improved and unimproved from ten to two dollars per acre; in the Central Basin, improved farms are worth from forty to sixty dollars. Population in 1870, 10,237, of which 1,501 were colored; acres assessed, 253,-816; valued at $1,520,201; total value of taxable property, $1,911,074. The water-power is as good as can be found in the State; the principal streams are Bark Camp Fork and Garrison Fork of Duck river. Some interesting ruins are found in this county. Nashville and Chattanooga, and Manchester and McMinnville Railroads furnish ample means of transportation. The principal villages and towns besides Manchester, are Tullahoma, Beech Grove, Hillsboro, Summitville, Pocahontas and Needmore.

CUMBERLAND COUNTY.

ORGANIZED 1856. *County-seat, Crossville*—One of the counties of the Cumberland Table-land; drained by Big Emory and its tributaries Daddy's creek and Obey's river; Caney Fork flows through the western part of the county. With the exception of a small part of the head of Sequatchie Valley, this county lies on the Cumberland Table-land. The surface is generally level or undulating, and thinly wooded. In many places there are glades of greater or less extent, which are, in fact, small prairies, destitute of timber, and covered with coarse, rank grass. The superabundance of water in the soil and on the surface is the cause of the absence of timber. Besides the glades there are extensive flats, covered mainly with post oak and black-jack. The ridges and hills, which, with a few exceptions, are but little elevated above the general level, are often gravelly, and sustain a larger and more dense growth of timber, among which are several varieties of oaks, chestnut, hickory, white poplar, pine, and sometimes elm and maple. The larger streams generally flow in narrow valleys below the general level, and the abutting hills are often rugged and steep. Crab Orchard Mountain, has an elevation of 1,000 feet above the mountain plateau on which its rests, being, in fact, a mountain on top of a mountain. Beginning near Big Emory river, it extends south-westwardly, rising gradually till an elevation of 1,000 feet above the Table-land is attained above Crab Orchard Gap, through which the road from Crossville to Kingston passes. At this gap it is cut completely in twain, leaving room for a large farm between the abutting ends. Continuing its course in the same direction, but having a less elevation, it is abruptly cut into at another point from the last by Grassy Cove. This cove is one of the most remarkable topographical features of the Table-land. Here we have between the two opposing ends of the mountain a beautiful and fertile valley eight miles in its greatest diameter from north-east to south-west, and four miles wide. It is depressed 300 feet below the average elevation of the Table-land, by which it is completely surrounded. The Crab Orchard Mountain, beginning again at the south-west end of the cove, contin-

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ues in a direct line to its abrupt termination at the head of Sequatchie Valley. About three miles of the head of Sequatchie Valley are included in Cumberland county, which is the only part of the county not on the Table-land. Though comprising but a small part of the area, it contains a very large part of the population and wealth. The soil is light, porous, sandy and unproductive for cereals; Irish potatoes and all kinds of fruits grow well; tobacco, corn and wheat, except on the best soils, make a poor return. Wild grasses are abundant, and stock-raising is a leading and profitable pursuit of the people. This county may be taken as a type of all the counties on the Table-land; lands are very cheap, down as low as one dollar per acre. Coal crops out along ravines in many places, and is said to be at Davis' fifteen feet and at Andrews eighteen feet in thickness. Iron ore exists in the head of Sequatchie Valley. Population in 1870, 3,461, of which only 98 were colored. Acres assessed, 877,093; valued at $600,786; total taxable property, $614,009.

DAVIDSON COUNTY.

ORGANIZED 1783. *County-seat, Nashville*—It contains 550 square miles, and lies in the Central Basin. The Cumberland river with eight convolutions, passes through the county from east to west, dividing it into two parts nearly equal. The surface configuration of the county is, for the most part, gently rolling, swelling in places to considerable heights, and forming rounded flat hills, or mamillary protuberances, and occasionally long ridges from which shoot out subordinate ones more or less at right angles. There are three of these main ridges: 1st. The Paradise Ridge, in the north-western part of the county, at the heads of White's, Mansker's and Marrowbone creeks. This ridge forms the edge of the Highland Rim. 2d. The Harpeth Ridge, which is the water-shed between the Cumberland and Harpeth rivers. 3d. The ridge dividing the Harpeth from Little Harpeth. In addition to these, or rather subordinate to them, are many inferior ridges between the streams, which also have spurs jutting out from them to such an extent as to give to the surface a very rough and broken appearance. Especially is this the case in the north-western part of the county. The part of the county south of the Cumberland is drained by Richland creek, Brown's creek, Mill creek, Little Harpeth, Stone's river and Stoner's creek. The part north of Cumberland is drained by White's creek, Mansker's creek and Dry creek. The soil south of the Cumberland is very fertile and produces well all the crops of the latitude; blue-grass grows spontaneously and luxuriantly; the land north of the Cumberland is moderately fertile, with many limestone rocks cropping out and approaching the surface. Stock-raising is a leading branch of husbandry and especially the breeding of blooded horses; since the beginning of the century the horses of this county have been famous; the cattle are of a high order of grades; dairy farming is carried on to a considerable extent; fruits grow well and find a ready market; mills are abundant; twelve macadamized roads enter Nashville and six railroads; Cumberland river is navigable for about nine months in the year. Considering the advantages of the county land is very cheap; good farms well improved, four or five miles from Nashville can be bought for thirty or forty dollars per acre; in the north-western part of the county land may be bought at two and three dollars per acre; building stone is abundant. The State capitol is one of the most correct buildings on the continent. The public schools are among the best and most successful in America; Vanderbilt University, the University of Nashville, Ward's Seminary, St. Cecilia's Academy, Fisk University and Tennessee College, are all located within or near the city limits. The wholesale trade of Nashville amounts to over $51,000,000 annually. Cotton, tobacco, flour, corn and peanuts are the staple articles of traffic. The other towns in the county are Edgefield, Madison, Edgefield Junction, Goodletsville, McWhirtersville, Brentwood, Bellevue, besides numerous small villages. Population in 1870, 62,897, of which 25,412 were colored. Acres assessed, 305,244; valued at $8,855,160; total taxable property, $26.683,765. Nashville has a population of about 40,000.

DICKSON COUNTY.

ORGANIZED 1803. *County-seat, Charlotte*—Population 1870, 9,340, of these 1,677 were colored. Acres assessed in 1873, 291,623; valued at $1,077,460; total value of taxable property, $1,232,543. This county is situated on the Highland Rim; its surface is mainly high Table-land, cut, or gashed by numerous creek valleys; the soil is sili-

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ceous and calcareous, moderately fertile, and grows tobacco, corn, wheat, oats, rye, potatoes, peanuts and fruits in remunerative quantities. Many fine farms lie in the creek and river basins. The principal streams in the county are Harpeth river and its tributaries Jones' creek and Turnbull creek; Yellow creek, Barton's creek, tributaries of the Cumberland; Pine creek, Cedar creek and Blue creek, tributaries of Duck river. Improved tillable lands are worth from six to ten dollars per acre; creek and river bottom farms from twenty to thirty dollars; unimproved lands from two to five dollars. Iron ore is abundant and two furnaces are in operation. The Nashville and Northwestern Railroad passes through the county, and the Cumberland river forms its northeastern boundary. Charlotte has a population of about 300. Many Pennsylvanians have settled in the county.

DeKALB COUNTY.

Organized 1837. *County-seat, Smithville*—About two-thirds of the county lies on the Highland Rim, the remainder being in the Central Basin, and in the valleys. The Highlands occupy the eastern and northern part of the county. The surface is gently undulating, the beds of the streams, except near the escarpment, being depressed but little below the general level. The western part of the county embraces several valleys of considerable size and great agricultural value, separated from each other by irregular ranges of hills, and there are isolated peaks and short ridges, some of which mount up to a level with the Highlands. These ridges are often connected with spurs jutting out from the serrated escarpment of the Rim-lands, and enclose between them valleys of greater or less size, which are the ramifications of the Basin. The soil in the Highlands is siliceous, and when resting upon a red clay sub-soil is very fertile. There are some areas of boggy land overgrown with whortleberry bushes, which, when drained, make excellent meadows. The timber of the Highland is scraggy black jack, hickory, and post oak. The price of improved land in this part varies from $2.50 to $6; in the valleys from $10 to $50. Underlying all the valleys and extending about half way up the hills, is found the limestone common to all the Central Basin. The timber of the hillsides is very dense and consists of poplar, beech, sugar maple, ash, linn and walnut. There are many lumbering mills. The leading farm products are corn, wheat, tobacco, rye, sorghum, barley and cotton; blue-grass grows spontaneously in the valleys and on the limestone hills; stock-raising is by far the most profitable branch of farming; fruit is grown in considerable quantities, dried and sent to market. The county is well watered by Caney Fork and its tributaries. Iron ore is found on both sides of Caney river in workable quantities. Population in 1870, 11,425, of these 1,104 were colored. Acres assessed, 192,726; valued at $1,510,563; total taxable property, $1,960,031. Want of transportation is the greatest drawback to the county.

FENTRESS COUNTY.

Organized 1823. *County-seat, Jamestown*—A county on the Cumberland Table-land, and on the north-east border of Middle Tennessee; spurs shoot out from the Table-land, upon which two-thirds of the county rests; towards the north-west, between these lie many fertile limestone coves and valleys. Taking the valleys altogether as one division of the county, about two-thirds of its area is cherty upland, while the other third is about equally divided between the coves and bottoms. The valley of Wolf river is one of the finest in the State, extending out in one place to the width of ten miles. All the south-eastern part of the county lies on the Table-land, and has the sandstone soil, and level or slightly undulating surface peculiar to that division of the State. Valley farms range from five to twenty dollars per acre, except the valley of the Wolf, where some farms would bring $100 per acre; improved mountain land is worth from fifty cents to ten dollars per acre; unimproved lands where there is no dispute about the title, range from twenty-five cents to one dollar and twenty-five cents per acre. Timber and crops same as in DeKalb; stock is raised extensively; highway pasturage is excellent and extensive; no railroads. The Table-land part belongs to the Cumberland coal fields and many extensive banks have been opened. Iron ore of good quality exists; water-power is excellent. Population in 1870, 4,717, of which only 170 were colored. Acres assessed, 355,457; valued at $392,267; the whole value of taxable property in 1873, was $413,658.

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FRANKLIN COUNTY.

ORGANIZED 1807. *County-seat, Winchester*—A county of Middle Tennessee, adjoining the Cumberland Table-land, a small portion, indeed, probably one-fifth, resting upon it. This county has a great variety of soils extending in belts from north-east to south-west. First, on the south-east is the mountain land with sandstone soil; productions and timber same as in Cumberland county. Second, running along the base of the mountain is a wide belt of red lands, furnishing a fine agricultural region; soil calcareous, fertile and extremely durable; products—corn, wheat, oats and hay. Next come the fine river lands of the Elk which flows through the county from north-east to south-west; west of the river lie the "barrens," which do not differ in appearance, in productions or in timber from the same quality of land described in Coffee county; the woods are usually open and furnish a luxuriant range for cattle in spring and early summer. Northern immigrants are succeeding upon this soil with fruits and small grain. No county is better watered than Franklin; the Elk, which is the arterial current of the county has numerous tributaries; many of them furnish superb water-power. There are two cotton factories in operation in this county. Lands vary widely in price; there are lands in Franklin county that cannot be bought for fifty dollars per acre, while there are others that can be bought for two dollars per acre—so great is the difference in the soil and location. Coal is found in workable quantities in that portion of the county on the Table-land. Fine beds of marble beautifully variegated exist, and are worked to some extent. The Nashville and Chattanooga Railroad passes through the heart of the county; the Sewanee company has a railroad passing from Tracy City, in Grundy county, to Cowan; the Winchester and Alabama Railroad connects Decherd with Fayetteville, the county-seat of Lincoln. Sewanee, the site of the University of the South, is on a spur of the Cumberland Table-land. Winchester, the county-seat, is on the Boiling Fork of Elk, and is surrounded by a fertile region. It is distinguished for the number and excellence of its female schools, and for the intelligence of its citizens. Population of the county in 1870, was white, 11,998; colored, 2,972; total, 14,970. Acres assessed in 1873, 277,479; valued at $1,557,230; total value of taxable property, $2, 081,318.

GILES COUNTY.

ORGANIZED 1809. *County-seat, Pulaski*—Population in 1870, 32,413, of this 12,738 were colored. Acres assessed in 1873, 370,430; valued at $5,411,041; the whole value of taxable property, $7,616,921. The topography of Giles county may be best understood by considering the entire area to have been once an unbroken table-land as high as the tops of the leading ridges, and that out of the leading ridges, and that out of this original table land the streams have since cut their deep valleys. This has caused the county to be made up of very many winding valleys, and high, often flat-topped, dividing ridges. Richland creek, a tributary of Elk river, is the most important stream, though not the largest in the county; it divides the county longitudinally, north and south, into two nearly equal portions; the stream has a large, wide valley which cannot be excelled, if equalled in the State for fine farming lands; Richland has also many tributaries, each with its fertile valleys; Elk river flows across the south-eastern corner of the county, receiving in its course many creeks and branches; Sugar creek is in the south-western corner; all these have deeply set and rich valleys; the number of creeks, large and small, is very great, so that the table-land mentioned above has been very thoroughly dissected by the waters. The northern boundary of the county lies on Elk Ridge, an important arm of the Highlands; this conspicuous ridge runs nearly east and west, dividing the waters of the Elk from those of Duck river, and cutting off the portion of the Central Basin of Middle Tennessee lying in Lincoln and Giles. The soils in the river basins and those in the part of the county lying in the Central Basin, are among the most fertile in the State. The western part of the county has thin soils and is on the Highland Rim; this region is well adapted to fruit and wheat; cotton is the money crop in the best portions of the county; wheat, corn, oats and hay are raised in considerable quantities. In 1870, Giles grew a larger amount of corn than any county in the State. Grapes are extensively cultivated, and in 1872, 25,000 gallons of wine were made in the county. Much attention is paid to the raising of fine stock. The best farms are worth from forty to sixty dollars per acre; those on the Highlands sell from five to ten dollars; unimproved land about half price. The Nashville and Decatur Railroad passes through the center of the county from north to south. Pulaski has a population of over 2,000.

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GRUNDY COUNTY.

ORGANIZED 1844. *County-seat, Tracy City*—It embraces 324 square miles, and had a population according to the last census of 3,250, of which only 137 were colored. It is one of eastern counties of Middle Tennessee, and more than half of it rests upon the Cumberland Table-land. The part of the county that lies upon the Table-land is generally flat, but deeply gashed by the valleys of streams; sometimes, also, as near Tracy City, knobs rise several hundred feet above the general surface. The head waters of Collins, Sequatchie and Elk rivers are also in this county. Many of the streams on the top of the Table-land have sufficient volume for milling purposes, such as the Firy Gizzard and Fire Scald. These mountain streams are very rapid, having perpendicular falls sometimes of thirty or more feet, especially where they begin to descend into the valleys. The soil on the Table-land is of the same character is that described on pages 12 and 13 of this pamphlet. In the coves and valleys very fertile limestone soils prevail. There is no finer region for fruit than the mountain lands of this county; grapes and apples do remarkable well. A considerable colony of Swiss have settled in this county and are making commendable progress in agriculture. On the low lands and in the coves there is an abundance of fine yellow poplar, black walnut, sugar tree, white and black oak, and on the top of the mountain there are two kinds of timber of great value—the yellow pine in large quantites, and chestnut oak, which grows in great abundance, the bark of which is much sought after by tanners. Besides, the top of the mountain is better supplied with *tie timber* than any part of the State accessible by railroad. The highway pasturage is very extensive and excellent, and the native wild grasses furnish one of the great sources of wealth to the county. Cattle can be fattened at almost a nominal cost. Wild lands are worth from one to three dollars per acre; improved lands on the mountain about double; in the valleys from ten to thirty dollars. A railroad runs from Tracy City to Cowan, in Franklin county, connecting there with the Nashville and Chattanooga Railroad. Coal is extensively mined; The Tennessee Coal and Railroad Company employs about 450 hands, and ships from 235,000 to 350,000 bushels of coal per month. Beersheba Springs is a favorite summer resort.

HICKMAN COUNTY.

ORGANIZED 1807. *County-seat, Centerville*—This is one the counties of the Highland Rim. Population in 1870, 9,856, of which 1,471 were colored; number of acres assessed in 1873, 359.551; valued at $1,465,638; total taxable property, $1,794,307. Duck river flows in a westerly direction entirely through the county; its tributaries Sugar creek, Beaver Dam, Piney, Swan, Lick creek and Leatherwood, together with Cane creek a confluent of Buffalo river, supply every part of the county with living water. The surface of the county is usually broken, and composed of high rolling ridges and deep ravines, pointing generally toward the streams, some level open barrens lie in the northern part of the county; the ridges are sterile and unproductive; soil siliceous, rocky and thin, but spots occur upon which grow a rank, "barren" grass, that sustains stock nine months in the year. The timber of the ridges is white oak, chestnut oak, red oak, black oak, hickory and chestnut; in the valleys poplar, beech, maple, oak, black walnut, boxelder, butternut and red bud prevail. Some rich areas of chocolate colored soil, such as occur in Montgomery county are found; this character of soil is greatly surperior for the growth of clover; the price of such land improved, varies from fifteen to fifty dollars per acre; bottom lands about the same; barren lands and rolling ridges from fifty cents to five dollars. The productions are corn, wheat, peanuts, oats and potatoes; peanuts is the staple money crop, as many as 250,000 bushels having been produced in a single year. Iron ore is very abundant and rich. Mineral springs are quite common. A large cotton mill is in operation at Pinewood, which makes 1,800 yards of cloth daily. There is no railroad in the county, though the Duck River Valley Railroad has been surveyed and is in course of construction.

HOUSTON COUNTY.

ORGANIZED 1871. *County-seat, Arlington*—On the Memphis and Louisville Railroad. This county lies between the Cumberland and Tennessee rivers, on the Highland Rim. the surface is high and rolling, and the soil flinty and poor on the ridges. The county is

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traversed by a high, bold ridge running north and south, known as Tennessee Ridge; it is the water-shed between the Tennessee and Cumberland rivers, and rises 250 to 400 feet above the general level of the county. From the western edge of this prominent ridge numerous affluents of the Tennessee river take their rise; east of the Tennessee Ridge, and tributary to the Cumberland, are Well's creek and Guices' creek; Yellow creek, rising in Dickson county, passes through the north-eastern corner of Houston, and empties into the Cunnberland within the limits of Montgomery county. The lands have, for the most part, sub-soils of tenacious clay, with a gravelly, cherty mass underlying; wheat, corn, tobacco, potatoes, oats, etc., grow well; but the land is better adapted to the growing of grasses than any other crop; herds-grass and clover grow admirably on the rolling lands, while timothy is becoming a favorite crop with those who own bottom lands; these bottom lands are of marvelous fertility. There is no better fruit land in the State than the high ridges in this county. Tennessee is noted for the certainty with which fruit trees bear upon it; peach orchards upon this ridge have not failed in thirty years. Ginseng is abundant. The lands on Well's creek and Cumberland river are among the best in the State. Considerable iron ore exists; fire clay is also found near Old Byron Forge. Lands are very cheap; good farms can be bought for ten or fifteen dollars per acre; river farms for about twenty-five. The county has ample facilities for transportation by the Cumberland river, the Tennessee and the Memphis and Louisville Railroad that connects the two. Erin is the principal town, lying on the railroad about the center of the county. Population about 6,000; acres assessed, 179,872; valued at $449,279; total value of taxable property, $512,100.

HUMPHREYS COUNTY.

ORGANIZED 1810. *County-seat, Waverley*—This county rests mainly upon the western edge of the Highland Rim; a portion also in the Western Valley, (see Natural Divisions, page 5.) The surface of the county is moderately uneven and the soil generous; the bottom lands on the Tennessee, Duck and Buffalo are rich, alluvial soils; most all the cereals are grown with profit, corn in particular, the average yield being about fifty bushels per acre; the Buffalo bottom is also well adapted to the growth of cotton; peanuts are the principal product of the county, the amount produced in 1872 being 250,000 bushels, and the average price one dollar per bushel; cotton is also grown to some extent; fruit grows well; every variety of timber occurs except pine; staves are largely shipped. The county is well supplied with water-power. Big Botton, one of the most noted bottoms in Middle Tennessee, lies on lower Duck River, it extends for fifteen or twenty miles above its mouth and contains 17,508 acres. The range in price of lands is very great in this county, being from fifty cents for high, poor ridges, to $100 for the best bottoms per acre. The Tennessee river and Nashville and Northwestern Railroad furnish the means of outlet. Manufactories of wood and woolen goods are in operation; iron ore is abundant. Population, 9,326, of which 1,295 are colored. Acres assessed, 322,131; valued at $1,225,508; total taxable property, $1,394,935.

JACKSON COUNTY.

ORGANIZED 1801. *County-seat, Gainesboro*—Population in 1870, 12,583, of this only 767 were colored. Since that period a portion of the county has been taken off to form Clay. Acres assessed in 1873, 175,162; valued at $968,379; total value of taxable property, $1,123,915. Topographically, this county is very much like Clay; Cumberland river traverses it and the high country on both sides of the river belongs to the Highland Rim; the valleys are cut down to the formation of the Central Basin; the county is well watered by the Cumberland and its tributaries; the soil in the valleys and dissected ridges is very fertile; the county is heavily timbered with poplar, hickory, oak, beech, etc. Productions—corn, wheat, oats, tobacco and the grasses. The best farms on the Cumberland are worth from twenty to fifty dollars per acre; improved places on the uplands may be bought for five to ten dollars. Cumberland river furnishes the only outlet to market.

LAWRENCE COUNTY.

ORGANIZED 1817. *County-seat, Lawrenceburg*—Belonging to the southern tier of counties of Middle Tennessee. Population in 1870, 7 036—625 of which were colored. Acres

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assessed, 343,743; valued at $970,526; total value of taxable property, $1,265,580. Lawrence is one of the counties of the Highland Rim and may be taken as a tyye of that division; it is an elevated plateau rising 1,000 feet above the sea, gashed by frequent streams, the bottoms upon which are very fertile; spots of chocolate colored soils of hundreds of acres in extent occur, which are as valuable as the creek bottoms; soil of the higher lands with the exception named is siliceous, thin and unproductive, except for fruits, where the sub-soil is a red clay and tenacious, the lands are rich, and when worn easily reclaimed. Timber on the uplands: chestnut, red oak, post oak and blackjack; the woods are open and "barren" grass abundant and nutritious. Productions: wheat, oats, barley, millet and buckwheat, corn and cotton; a small quantity of tobacco is raised; fruits are very prolific in their yield. Land is in more active demand than in almost any county in the State, owing to the large German immigration and to the prospects of building a railroad from Knoxville to Memphis, to pass through the county. Good farms may be bought for twenty dollars per acre. The water-power is the best in the State, or at least it has been utilized to a larger extent. Upon Shoal creek and its tributaries five cotton factories are in operation, and on Little Buffalo, sixteen miles from Lawrenceburg is another, running in the aggregate 6,310 spindles and 118 looms, and giving employment to 310 operatives. The county is rich in iron ore; marble is also abundant and of a very beautiful variety.

LEWIS COUNTY.

ORGANIZED 1844. *County-seat, Newburg*—It contains about 350 square miles, and is one of the counties of the Highland Rim. For agricultural purposes it is probably the poorest county in Middle Tennessee. Only about 9,168 acres out of 225,920 are in cultivation, while the number asssessed for taxation is only 120,090, or about one-half of the actual number in the county; value of the land assessed, $218,189, and the total taxable property amounts to $230,880. Population in 1870, 1,986, which included 188 colored persons. Topographically, Lewis county is a high, level plateau, higher than the surrounding counties, and gashed by frequent streams that take their rise in the county, and flow from it to nearly every point of the compass. Near the streams, and beyond the immediate bottoms, the land is ridgy, sterile in character and covered with a dense growth of red oak, chestnut, and a tough variety of poplar. This quality of land is in no demand, and thousands of acres may be bought at prices varying from fifty cents to two dollars per acre; a mile or two out from the streams the lands become flat and open, and are covered, for the most part, with scraggy blackjacks and "barren" grass, which furnishes good grazing from April to November. The soil upon these lands is thin, and to some degree porous and leachy; the bottom lands are very productive and command a high price, ranging from twenty to thirty dollars per acre. The county is well watered, fifteen streams either take their rise in the county or pass through it. Iron ore is plentiful and one furnace is in operation making charcoal iron.

LINCOLN COUNTY.

ORGANIZED 1809. *County-seat, Fayetteville*—Population, 28,050, of which 5,953 are colored. Lies almost wholly within the Central Basin and contains about 317,079 acres; valued at $4,087,394; total value of taxable property, $5,178,933. Surface diversified by numerous ridges and valleys; Elk river divides the county into nearly equal parts, and has some fourteen tributary creeks within the county. The rock is mainly limestone. The soil excepting a strip on the Alabama line, about eight miles wide, which is on the Highlands is fertile; that of Elk river and Cane creek valleys very rich, usually producing near 1,000 pounds seed cotton to the acre. The timber is maple, linn, hickory, black locust, walnut, beech and some cedar in the Central Basin part of the county; chestnut and oaks on the Highlands. Corn is generally fine; wheat satisfactory; millet abundant, and on the sunny slopes of the knobs, blue-grass pasturage the year round; stock-raising remunerative. 3,393 farms, about one-third between twenty to thirty acres; price of land ranges from three dollars per acre for the flat uplands to fifty dollars for the valleys; little sold—rents easily. This county has more capital in live stock than any other in the State. Fayetteville has a population of 1,800, and is situated near the junction of Norris creek with Elk river; it is terminus of the

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Winchester and Alabama Railroad. Molino, Mulberry, Petersburg and Oregon are all thriving villages. Some curious antiquites in the shape of earthworks are found near. Fayetteville.

MACON COUNTY.

ORGANIZED 1842. *County-seat, Lafayette*—This county, except small parts of the valleys of Goose creek and Dixon's creek, near the southern boundary, lies wholly on the Highland Rim; it is a border county, bounded by Kentucky on the north. From the escarpment of the Rim, near the southern boundary towards the north there is a good stretch of level and gently rolling country; south of this escarpment or "ridge," the Highlands break off in steep declivities which run down into deep valleys, where the rock, soil, timber and productions indicate a different formation; this ridge is the water-shed—the streams flowing in opposite directions from it; the soil on the Highland is siliceous, like that in Lawrence county; the portion of the county south of the ridge is in the Central Basin and is very fertile, being calcareous, light and loamy. Timber on the elevated portions of the county consists of chestnut, poplar, hickory, post oak and white oak; on the cherty hillsides and in the limestone valleys, sugar maple, beech, black walnut, hickory, sweet gum, large oaks and linn. Improved farms on the Highlands range from eight to twenty dollars; unimproved, five dollars; farms south of the "ridge" are worth from twenty-five to forty dollars per acre. The leading crops, in the order of their value, are corn, tobacco, wheat, oats and potatoes. There were produced in 1870, 256,483 bushels of corn, 950,768 pounds of tobacco, 30,525 bushels of wheat, 60,756 bushels of oats, 9,441 bushels of Irish, and 9,340 bushels of sweet potatoes. Orchards succeed well in all parts of the county. Lafayette is the only town; no railroads in the county and no navigable streams; mineral springs are numerous. Population in 1870, 6,633, of which 791 were colored. Acres assessed in 1873—176,223; valued at $829,647; total taxable property, $987,802.

MARSHALL COUNTY.

ORGANIZED 1836. *County-seat, Lewisburg*—Population, 18,348, a fourth of which is colored. Acres assessed, 227,765; valued at $3,771,873; total value of property, $4,625,106. This county is in the Great Central Basin, and is not surpassed in natural agricultural advantages by any county in the State. Duck river passes nearly through the center of the county from east to west, and has numerous tributaries flowing into it from the north and south. Running east and west through the southern edge of the county is Elk Ridge, which separates the waters of the Elk and Duck rivers. North of Elk Ridge the lands are more level, though not so well adapted to the growth of cotton; as those south; corn, small grain, and all the grasses, potatoes—both sweet and Irish yield abundantly. On the projecting spurs of Elk Ridge the soil is light, porous, warm and generous; north of Duck river the lands are very level and fertile, and have a more reddish hue than elsewhere in the county; in this portion cedar is almost entirely used for fences. Timber and productions same at in Giles, except that there are in Marshall large cedar forests, perhaps the most valuable in the State. Lands are very high, good farms well improved, selling for from forty to sixty dollars per acre. Much attention is paid to the raising of stock, especially in the Connersville district, where blue-grass grows luxuriantly.

MAURY COUNTY.

ORGANIZED 1807. *County-seat, Columbia*—Number of acres 366,910, exclusive of town lots; valued at $7,650,478; total taxable property, $11,109,144. In point of country wealth Maury ranks first in the State. An orographic view of the county would present the picture of a section of a river valley running almost due east and west, with the dip to the west, and fringed to the north and south by smaller valleys which furrow the sides of irregular ranges of knobs or hills that lie along the northern and southern boundaries of the county. To the west, these hills broaden out into the uplands known as the "barrens" forming a part of the Highland Rim. The bed of this valley is occupied by Duck river, which flows through the whole extent of the county, dividing it almost equally. This river drains the entire county; all other streams in the county

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flow into it. It is not navigable, though it is floatable through the entire extent of the county, and was, in former years, much used for the transportation of corn and lumber, principally cedar. Timber—characteristic of the Central Basin and same as in Marshall, Giles, Bedford, etc. There are four leading divisions of lands, the "barrens," the creek bottoms, the cedar lands, and the rich limestone and clay soil, the latter constituting the bulk of the county. Probably the finest farming lands in the State and the best improved are west of Columbia, between the Little Bigbee and Big Bigbee creeks, including the region around Mount Pleasant. With such variations in quality, land ranges from $100 per acre for small, highly improved places, in good neighborhoods, down to one dollar for wild lands in the "barrens," plenty of which can be had at that price. It is hard to give an idea, but excellent places, with tolerably good improvements, and conveniently situated, have sold for thirty-five to forty dollars per acre, and fair lands near them at twenty and twenty-five dollars, on usual time. The average yields on the better class of soils is about, corn, 30 bushels; wheat, 13 bushels; cotton, 600 pounds (seed); tobacco, 900 to 1,000 pounds; very little tobacco or peanuts are grown; hay, 1¼ tons, though it is rarely weighed or sold. On the poorer class of soils not over two-thirds of this, perhaps not over one-half. The barrens and cedar lands are meant by this class. There is not one acre in forty or fifty actually thrown out of cultivation and gone to waste from exhaustion. It should be borne in mind that with high farming and good culture, the yield of the various crops might be increased two or three times what it is under the slipshod farming practiced all over the State. There are twenty-three towns and villages, which have the usual facilities of stores, schools and churches. Columbia is noted as a center of refinement and culture. In point of wealth Maury stands the third in the State, Shelby being first, and Davidson second. It had a population, by the census of 1870, of 36,289, of which 16,265 were colored. Number of polls 4,728, number of voters 6,521, of whom 2,405 are colored.

MONTGOMERY COUNTY.

ORGANIZED 1796. *County-seat, Clarksville*—Population in 1870—24,847, including 11,670 colored. Acres assessed, 312,686; valued at $3,341,880; total taxable property, $5,716,025. This is one of the counties of the Highland Rim, and belongs to the northern tier of counties of Middle Tennessee. The general surface of the county is undulating, with a mean elevation of 500 feet above the sea. The county is well watered by the Cumberland and its tributaries, the chief of which is Red river, which flows east and west through the entire half of the county. The soils are strong and durable. They produce well and are easily reclaimed after exhaustion. Resting upon a bed of red clay with layers of interstratified chert, they have the capacity of retaining moisture without suffering from a want of drainage. Calcareous and siliceous, they combine the strength of the one with the friableness of the other. Though not so rich generally in the elements of plant food as those in the Central Basin, they are more reliable for the production of crops. South of the Cumberland the land is hilly and broken, and the soil thin; south of Red river, though the country is considerably broken the soil is fertile; near the southern limits the lands are flat and poor; north of the Cumberland and Red rivers there is a magnificent farming region. Timber south of the Cumberland and Red rivers is very fine and consists of oak, poplar, hickory, walnut, etc. In the northern part of the county though there are some areas well timbered, yet it is not so abundant or valuable as in the other divisions mentioned, though the soil is excellent. Productions are corn, wheat, oats, hay, tobacco, clover and potatoes. The average amount of tobacco grown annually in the county is 3,500 hogsheads, or about 5,000,000 pounds, or one-fourth of all that is raised in the State. Sometimes the crop reaches 5,000 hogsheads. The average yield per acre is 850 pouuds, though the best soils often produce 1,000, 1,200, and sometimes more. It is noted for its fine quality. There is probably no land in the State better adapted to wheat than the best uplands in Montgomery. The siliceous soils, strongly impregnated with lime, give strength to the straw while they also give plumpness to the berry. Under the best system of tillage the yield often reaches thirty bushels per acre, and some few farmers have raised forty. In proportion to their productive capacity, there are no cheaper lands in the State, especially when the admirable means of transportation is taken into consideration. Good farms, well improved, can be bought for twenty-five and thirty dollars per acre; medium twenty to twenty-five; the river bottom farms from thirty to forty. The Louisville and Memphis

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Railroad runs diagonally through the county and intersects the St. Louis and Southeastern Railroad at Guthrie, Kentucky, near the State line, thus placing St. Louis, Nashville, Evansville, Louisville, Cincinnati and Memphis within a few hours run. There is an inexhaustible supply of good iron ore in the county. Clarksville, situated on the banks of the Cumberland river and on the Memphis and Louisville Railroad, has a population of 5,000, and does a business amounting to $1,750,000 annually. The city schools are excellent.

MOORE COUNTY.

ORGANIZED 1872. *County-seat, Lynchburg*—Formed from parts of Lincoln and Franklin. Contains 98,024 acres; value $983,484; total value of taxable property, $1,130,168. The surface of the county is greatly diversified. On the eastern border it is a high, flat, slightly rolling plain, which breaks off to the south and west into ridges and ravines, some of the latter having a depth of 300 to 400 feet below the plain. These ridges are spurs which shoot out into the valleys of the Elk and Mulberry and their tributaries, the valleys constituting a part of the broken southern division of the Central Basin, which is partially cut off by Elk Ridge. About one-half of the county lies upon the Highland Rim, and the remainder in the Central Basin. These ridges are very fertile on the slopes and often to their very summits. Elk Ridge runs east and west, between Duck and Elk rivers. It is narrow and irregular but very productive, almost as much so as bottom land. This ridge is a type of the others. Twenty bushels of wheat and thirty bushels of corn are the average products of the valleys. The flat lands hardly pay for cultivation except for fruit and tobacco. The county is well timbered and watered; Elk river, Mulberry and Hurricane, all furnish mill sites. Improved places range from six to forty dollars per acre. Large quantities of "Lincoln County" Whiskey are made in this county.

OVERTON COUNTY.

ORGANIZED 1806. *County-seat, Livingston*—Population in 1870—11,297, of which 550 were colored, but since that time nearly a third of the county has been cut off to form the new county of Clay. Acres assessed in 1873—254,618; valued at $787,263; total value of taxable property, $828,465. The south-east corner of this county rests upon the Cumberland Table-land, and presents the characteristics common to that division of the State. Between the east and west fork of Obey's river there is a ridge or arm very irregular in outline extending northward for fifteen miles. This ridge is of the same elevation as the Tableland, but in places drops down to "terraces" or "benches" which occupy a large part of the county; their elevation is about half of the Table-land; verdant valleys and coves nestle between these spurs, which fringe the Table-land. The soils are rich wherever limestone appears above the terraces. The timber is dense and heavy; poplar, oak, shell-bark hickory, sugar maple, etc., are found in the rich soils. The bench lands away from the vicinity of limestone are leachy and thin, and chestnut trees, oaks, etc., prevail. Half the lands are almost worthless except for pasturage; unimproved lands range in price from ten cents to ten dollars; ten dollars is perhaps the average, and twenty dollars per acre is perhaps the highest limit for farms that are for sale. The leading crops, in the order of their importance, are corn, wheat, tobacco, oats, rye, cotton, potatoes and turnips. The county is very well watered by Obey's river and its tributary West Fork and Roaring river, a confluent of the Cumberland. Coal is found near Obey's river. Petroleum has been found in large quantities.

PERRY COUNTY.

ORGANIZED 1821. *County-seat, Linden*—Population in 1870—6,925, of which 472 were colored. Acres assessed, 220,139: valued at $1,011,850; total value of taxable property, $1,235,085. The topography of this county is beautiful, from the regularity and great number of ridges. Buffalo Ridge, west of Buffalo river, rises to the height of 700 feet above tide water, and 300 feet above the adjacent valleys. It traverses the county longitudinally north and south throughout its entire extent, and sends out westward eight subordinate ridges, nearly to the Tennessee river, a distance of nine miles.

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Between these various ridges, streams of pure sparkling water flow in parallel lines, and empty into the Tennessee river. On the eastern side of Buffalo Ridge are parallel spurs, about one mile in length, and the troughs which they form convey the waters from the eastern slope into Buffalo River. The portion of the county east of Buffalo river is also fluted with ridges and valleys. White oak, walnuts, black oaks and hickories of magnificent size, prevail upon all the slopes and in the bottoms; chestnut oak is very abundant. The finest soils are in the bottoms; dark in color, they are heavily charged with flinty quartzose gravel, sometimes comminuted until it approaches a coarse sand; the soil is especially adapted to the cultivation of peanuts, and this crop, for a number of years, has been the principal staple of the county; cotton, wheat, corn, oats and hay are also grown remuneratively. Improved farms range in price from fifteen to forty dollars per acre; unimproved good lands from three to ten; ridge lands one dollar. Marble, hydraulic rock and iron ore are found in considerable quantities. Tennessee and Buffalo rivers furnish the only outlets, the latter is not navigable for steamboats.

PUTNAM COUNTY.

ORGANIZED 1842 *County-seat, Cookville*—Population in 1870—8,698, only 530 of which were colored. Acres assessed in 1873—216,525; valued at $790,150; total value of taxable property, $890,712. It is the most irregular in outline of any county in the State. East to west it extends a distance of forty miles, while its average width is not more than twelve. The eastern end, comprising about one-eight of its area, is on the Cumberland Table-land. The east and west forks of Obey's river flow north, Spring creek north-west, Fallingwater nearly west, Calf Killer river south-west, and just across the line, in Cumberland county, are the head springs of Emory, which flows east into Clinch river, above Kingston. These streams, except the last, in their descent from this elevated plateau, have cut through the western escarpment, forming many deep ravines and sequestered valleys, with towering ridges projecting between. The scenery here is remarkable for its wildness and sublimity. As one approaches the central part of the county, the valleys become wider, and the ridges and spurs run out into lower hills, or disappear entirely. This is the clay region, a broad belt of which extends along the western base of the Table-land. This belt is about fourteen miles wide, and is the best part of the county. Its surface is diversified with hill and dale, the beds of most of the streams being considerably below the general level of the country. The county becomes more level and the lands less fertile towards the west, until the part of the county designated by the significant name "barrens" is reached. The surface is generally level, except in the neighborhood of the streams, and the timber is thin and of small size. The soil of the Table-land is described on page 12; that of the red clay belt on page 16 and that of the level flat lands on page 14. Lands are very cheap, ranging from fifty cents for unimproved mountain lands to fifty dollars for the best improved stock farms. The leading field crops in the order of their importance are corn, tobacco, wheat, oats hay, potatoes, turnips, cotton, buckwheat and barley; clover and the grasses grow wild. Water-power is excellent. Coal exists in abundance in the eastern part of the county. Extensive iron banks occur.

ROBERTSON COUNTY.

ORGANIZED 1796. *County-seat, Springfield*—Population in 1870—16,166, of which 4,813 were colored; number of voters in 1871, 3,112; acres of land assessed in 1873, 284,116; valued at $3,408,035; total value of taxable property, $4,516,117; number of polls, 2,436. Robertson county reported in 1870, 140,641 acres of improved land; 139,456 woodland, and 5,020 of other unimproved. The surface is generally broken, except near the Kentucky line, where it becomes a level plain. A small strip of level plateau land also bounds the southern and eastern borders. The middle belt running east and west is more broken, but is quite fertile. The county is watered by Red river, Sulphur Fork and other smaller streams. The St. Louis and Southeastern Railroad passes through the county. Land ranges in price from two to fifty dollars per acre; good farms can be bought for twenty-five dollars favorably located; wild, unimproved lands, level and moderately fertile, may be bought for two and three dollars. Products same as in Montgomery county. Whiskey-making is carried on to a larger extent than in any other county in the State.

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RUTHERFORD COUNTY.

ORGANIZED 1804. *County-seat, Murfreesboro*—Population in 1870—33,289, of which there were colored, 16,478. Acres assessed in 1873—379,707; valued at $6;892,102; total value of taxable property, $9,514,975. This county, one of the most noted in the State, occupies the geograpical center of the State and also the center of the great Central Basin. The soil is very fertile, and is of two colors, black and red. The sub-soil is a rich red clay. Cotton is the staple crop. Corn, wheat, potatoes, oats and the grasses all make remunerative yields. Prevailing timber is oak, hickory, cedar, poplar, walnut and beech. Many of the farms are fenced with cedar. First-class improved farming lands, without dwelling-houses, can be purchased at from twenty-five to sixty dollars per acre, depending entirely on the location; with dwellings, add about one-half of the cost of the building to this price. Unimproved lands are worth as much as the improved, on account of the value of the timber. There are a great many farms in this county now that can be purchased, as the tendency is to cut up large plantations into small farms. The county is watered by the east and west forks of Stone's river, and other tributaries, which furnish ample water privileges. Springs and ponds abound, and stock-water except in very dry seasons is abundant. The capital of the county is mostly invested in agriculture, and there are but few portions of the South where better soil and a more intelligent people are found. The Nashville and Chattanooga Railroad passes through the county. Eleven macadamized roads center at Murfreesboro. In addition to Murfreesboro, the other towns are Readyville, Milton, Jefferson, Smyrna, Lavergne, (the last two on the railroad,) Versailles and Eagleville.

SMITH COUNTY.

ORGANIZED 1799. *County-seat, Carthage*—Population in 1870—14,994, of which there were colored 3,536. Acres assessed in 1873—192,902; valued at $2,364,973; total value of taxable property, $2,841,259. To one coming down the Cumberland river from Burksville, Kentucky, to Nashville, Smith is the first county fairly within the Central Basin. The surface is rolling and hilly. The county is remarkably well watered by the Cumberland and Caney Fork and their tributaries. Nearly all of these streams have wide and exceedingly fertile valleys. Corn, wheat, oats, rye, hay and tobacco are the principal crops cultivated, for all of which the soil is well adapted. Timothy, herds-grass and clover are the chief hay grasses, though a number, especially of tobacco farmers, still persist in the folly of sowing annual grasses for hay. Blue-grass does well. Every hill in the county might be covered with this beautiful and profitable grass. Stock-raising is carried on to a considerable extent and is profitable. Orchard-grass has done well in the few instances in which it has been tried. The most valuable timber is poplar, oak and black walnut. Poplar is the most abundant, and is used for lumber and shingles, and in that form has been exported in considerable amounts. Orchards have been extensively planted in the last few years. Lands range from six to sixty dollars per acre, according to improvements and location. This is said to be the best poor man's county in the State—the bottom being very fertile but not large enough to tempt the wealthy to want them for homes.

STEWART COUNTY.

ORGANIZED 1803. *County-seat, Dover*—Population in 1870—12,019, of which 2,700 were colored,)since that period about one-third of county has been taken off to form the new county of Houston.) Acres assessed in 1873—257,042: valued at $1,180,415; total taxable property, $1,524,379. Stewart county, like all the counties on the Highland Rim, has a high elevation above the sea, and is drained by frequent and rapid streams. The Cumberland passes through the county. Between the Tennessee and the Cumberland is an elevated ridge, called the Tennessee Ridge. This is the water-shed between the two streams. Numerous subordinate ridges shoot out from this main one, more or less parallel with each other, between which numerous streams descend on the west to the Tennessee, and on the east to the Cumberland. The region between the rivers is much broken. On the north-east side of the Cumberland the country is more level, and some rich areas are found remote from the streams. The surface of the country grows more level as one travels back from the river, until in the north-eastern part of the

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county, it is prairie-like in its flatness, highly fertile, and unsurpassed by any portion of the Highland Rim in its attractions for the farmer and the advantages it offers to the industrious. The lands may be divided into mineral and agricultural. The mineral or iron lands are found on both sides of the Cumberland, extending to the Tennessee on the west, and cover fully one-third of the county. For half a century Stewart county has been the center of the great iron interests of Middle Tennessee. Ridge lands between the rivers are worth from three to five dollars per acre; bottom lands, from five to fifteen dollars, according to improvements; the flat, rich red lands near the Kentucky line, from twenty to forty dollars. The productions and timber are about the same as in Montgomery county. The Cumberland has not less than sixteen tributaries in this county, and the Tennessee five, supplying the whole county with running water except the north-eastern portion, where, though the lands are the most valuable in the county, running water is scarce. Several colonies have settled in this county. The Tennessee Ridge is heavily timbered, and large numbers of staves are made for foreign markets. Five furnaces are in operation making pig-iron.

SUMNER COUNTY.

ORGANIZED 1786. *County-seat, Gallatin*—Population in 1870—23,711, of which 7,777 were colored. About one-sixth of the territory of the county has since been added to Trousdale. Acres assessed in 1873—308,399, valued at $3,697,504; total value of taxable property, $5,185,727. The northern half of Sumner lies upon the Highland Rim and the southern half within the Central Basin. This is a fundamental fact, and will explain the great contrast there is between the two portions. The northern half is a high plateau country, having an elevation of 800 to 900 feet above the sea, the most elevated portions reaching 1,000 feet. The southern half lies several hundred feet below this, and presents a most fertile region, one of the best in Tennessee, in a high state of cultivation, and greatly in contrast with the wooded flats of the other portion. From the "Ridge" the waters flow northward with very little slope into the Barren river in Kentucky, and into the head branches of Red river in Robertson county. South of the "Ridge" the creeks, taking their rise at the base of the escarpment, flow southerly with considerable fall into the Cumberland river, which bounds the county on the south. The valleys of these creeks are generally separated by ridges, which are finger projections from the "Ridge" or Highlands. Near their origin, these dividing ridges are high and rough, but as they approach the river, they break away into low hills and not unfrequently into a nearly level country. The Central Basin part of the county is one of the finest blue-grass regions in the State. Stock-raising is the principal branch of husbandry in this part. Blooded horses and cattle are quite common. The timber is oak, ash, maple, hickory, walnut, beech and black locust. The lands in this part of the county may be classed in three qualities: bottom lands, creek and river; second bottoms or higher lands, generally with chocolate-colored sub-soil, and mulatto lands, the latter generally having limestone cropping out, and are seriously affected by drought. Cotton, corn, wheat and hay are the general products, the cotton being principally raised in the south-western portion of the county. Broom-corn is cultivated successfully. Irish and sweet potatoes are raised in abundance for home consumption. The prices of lands vary from twenty to sixty dollars per acre, according to locality, improvements, etc. Fruit trees in the Basin are short-lived, except upon gravelly soil. Upon the Highlands the sub-soil is a rich red clay, and the lands are well adapted to the raising of wheat and tobacco. The price of improved farms in this portion varies from five to to thirty dollars per acre. The Louisville and Nashville Railroad passes through the center of the county; the Cumberland river bounds one side, and the Cumberland and Ohio Railroad is in course of construction. Gallatin has a population of 3,000 and is a flourishing town with several manufacturing establishments. Nine macadamized roads enter the town.

TROUSDALE COUNTY.

ORGANIZED 1870. *County-seat, Hartsville*—A new county established by a special provision of the new constitution. It is the smallest county in Middle Tennessee and one of the richest. It contains only about 110 square miles. Acres assessed in 1873—66,874, valued at $888,119; total value of taxable property, $1,152,904. It has a voting

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population of 1,351, including 346 colored; estimated from the number of voters the population is about 6,700, of which about 2,000 are colored. This county, with the exception of its south-eastern corner, lies, in the main, between the Highlands, (so wide-spreading in Macon and in the northern part of Sumner,) and the Cumberland river. It is thus within the Central Basin. The area of the county is made up of valleys separated by ridges, whose slopes, like the valleys, are rich and productive; the surface is much broken. The ridges are the southerly prolongations of the spurs of the Highlands, which become broken and generally lower as they approach the Cumberland. The soils are rich and mellow, producing in good seasons, corn, wheat, tobacco and the other crops of this latitude in luxuriance. A large proportion of the timbered lands has been cleared of the underbrush and seeded to blue-grass, and supplies good pasturage through many months in the year. The timber consists of poplar, white oak, walnut, sugar tree, etc., though not abundant. The county is watered by the Cumberland river, East, West and Big Grove creeks. The price of improved farms varies from twenty to sixty dollars per acre. The staple crops are corn, wheat, tobacco and hay, the latter is mostly made of the annual grasses, such as Hungarian-grass and German millet. The average yield of tobacco, on the best soils is near a thousand pounds per acre; of corn, forty bushels; of wheat, fifteen bushels. Stock is extensively raised and much attention is paid to the smaller industries. Produce finds its way to market by the Cumberland river. Three macadamized roads center at Hartsville. This town has a population of 700 and is the center of a good tobacco trade.

VAN BUREN COUNTY.

ORGANIZED 1840. *County-seat, Spencer*—Population in 1870—2,725, of which 156 were colored. Acres assessed in 1873—140,806; valued at $223,617; total taxable property, $259,493. The county, lying partly on the Cumberland Table-land, and partly on the mountain slopes and in the valleys, presents great diversity in surface, soil and productions. The Table-land part embraces the sorth-eastern part of the connty. The slopes on the sides of the Table-land, and its spurs and outlying ridges, are an important feature, and occupy a considerable part of the area of the county. These are too rugged for cultivation and are valuable principally for the timber. Spurs of greater or less magnitude extend outward at irregular distances apart, sometimes enclosing valleys or coves of considerable size, in some of which the best lands in the county are found. Beyond the range of these spurs are the red clay lands, extending north to the Caney Fork and west to Rocky river. The surface is generally broken or undulating. All of the streams, except the larger creeks, are underground. Bordering Caney Fork and Rocky river, which form the boundary of the county on the north and west, are bold bluffs of limestone extending down to the water's edge. A description of the soil of the Table-land and its adaptability may be found on pages 12 and 13. The coves have the richest soil of all the lands in the county. In some of them the soil overlying the clay sub-soil is ten feet deep. Very heavy crops of the cereals are taken from them year after year without any diminution of their productive powers. In the valleys the soil is a dark rich loam, resting on a sub-soil of strong clay, and with good tillage it is inexhaustible. The productions are corn, wheat, rye, oats, sorghum, tobacco, potatoes and turnips, cabbage, beets, sweet potatoes, parsnips, tomatoes, squashes and melons. The Table-land, as a general rule, is thinly wooded, but has much valuable timber, chiefly oaks and chestnuts. The mountain sides, gulfs and ravines are very heavily timbered with chestnut, poplar, ash, maple, walnut, buckeye, cherry, linden, beech and other varieties. In the coves and valleys there are still large quantities of very fine timber.

Good improved lands in the valleys can be bought at fair prices, ranging generally from five to twenty dollars per acre, though some of cove lands have recently sold as high as fifty dollars per acre; unimproved valley lands range from five to ten dollars per acre; improved mountain farms can be bought at from one to ten dollars per acre; unimproved mountain lands sometimes sell as low as ten cents per acre, never above one dollar. Stone coal and limonite iron ore exist in considerable quantities.

WARREN COUNTY.

ORGANIZED 1807. *County-seat, McMinnville*—Population in 1870—12,714 of which 1,955 were colored. Acres assessed in 1873—247,070, valued at $1,800,862; total tax-

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able property, $2,535,768. Excluding the portion on the Cumberland Table-land, the county may be said to be flat highland, but sufficiently cut by streams, with tolerably deep valleys, to give contrast and variety to the surface. The eastern portion is made rough by the spurs and outliers of the Table-land, and supplies many mountain valleys, coves, and often wild picturesque gorges, precipices and water-falls. The south-eastern part of the county lies on the Cumberland plateau, and has the elevation, soil and physical features which pertain to that region. (See pages 12 and 13.) Three-fourths of Warren county consists of red lands similar in character and fertility to that in Montgomery county. The remainder of the land is mountainous, but some of the best lands are to be found in the coves. These are usually very productive, and yield from thirty to forty bushels of corn per acre, while for fruit they are considered unequalled, especially for the apple. The largest orchards in the State are in this county. The timber consists of ash, yellow poplar, linn, buckeye, sugar tree, hickory, every species of oak, black walnut, wild cherry, dogwood and black locust. Corn is the leading crop; then come, in the order of their importance, wheat, oats, fruit, sorghum, sweet and Irish potatoes, tobacco, cotton, grass seed, rye and hay. Clover is extensively sown, the red soils being specially suited to its growth. Apple brandy is extensively manufactured. The county is well watered by Collins river, Barren Fork, Charles creek, Mountain creek, Caney Fork and others, and the water-power is very valuable, much of which has been utilized in cotton manufacture. Hydraulic rock is abundant, and coal is found on the spurs of the Table-land. McMinnville has a population of about 1,200, and is a thriving town. There are numerous villages.

WAYNE COUNTY.

ORGANIZED 1817. *County-seat, Waynesboro*—Population in 1870—10,209, of which 893 were colored. Acres assessed in 1873—422,267, valued at $1,243,009; total taxable property, $1,664,494. Wayne county is situated on the extreme western side of the Highland Rim, with its north-western corner projecting into the western valley of the Tennessee. It contains about 700 square miles. It is a high elevated plateau, between 800 and 1,000 feet above the sea, furrowed by deep winding ravines or "hollows," with intervenient high rolling ridges, cut transverely in places by other ravines, which give the surface of the county the appearance of what sailors call a "chopped sea." The county is watered by the tributaries directly or indirectly of the Tennessee river which washes a portion of the west boundary of the county and furnishes the only outlet. The lands in Wayne county may be divided into three classes, viz: mineral, agricultural and grazing. Of the first class there are more than 200 square miles, lying in the eastern and south-eastern parts of the county. These lands usually have a rolling surface, are well supplied with timber, except in those spots where it has been consumed in the manufacture of charcoal. The soil upon these minerals lands is exceedingly sterile. The agricultural lands are mostly confined to the river and creek bottoms. They are heavily charged with a black, flinty, angular rock; soil alluvial and highly productive of wheat, corn, cotton, peanuts, sorghum and hay. These lands command very high prices, ranging from twenty to fifty dollars per acre, according to improvement and location. The third class of land, which is put down as grazing land, is flat and open, covered during the summer with a rank wild grass, which supplies nearly all the food for the stock, (other than work stock) in the county for eight and ten mouths in the year. This land is worth from one to three dollars per acre. Very few counties in the State are more abundantly supplied with timber. The southern part is covered with a dense forest of yellow pine, which has scarcely been touched. On the ridges, white oak, black oak, chestnut, poplar and chestnut oak prevail. The white oak timber is largely consumed in the manufacture of pipe staves for the French and Spanish markets. Hydraulic rock of an excellent quality occurs near Clifton in inexhaustible quantities. Iron ore (limonite) is abundant and yields from the furnace about 44 per cent. Only one furnace is in operation. Clifton and Waynesboro are the principal towns.

WHITE COUNTY.

ORGANIZED 1806. *County-seat, Sparta*—Population in 1870—9,375, of which 1,080 were colored. Acres assessed for 1873—217,101, valued at $1,140,836; total value of

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taxable property, $1,320,610, In its topographical features the county is divided into three parts: the Table-land or mountain, the valleys and coves, and the barrens. These three divisions give great diversity of elevation, soil and productions. The eastern side of the county, comprising about one-fifth of its area, lies on the Cumberland Table-land, and has all the characteristics of this natural division of the State. (See pages 12 and 13.) At about half the height of the Table-land is the terrace or "bench." This terrace has the same elevation as the tables or tops of most of the little mountains or outliers. It affords sites for some beautiful farms and orchards, where all varieties of fruit common to the country are produced. The Calf Killer Valley occupies a belt across the county, and is twenty-five miles long, with an average breadth of four miles. The surface is generally rolling, and there are no bottoms along the river. An interesting topograpical feature is presented by the sink holes, which are very numerous in this valley. Other valleys furnish fine farming lands. Sugar maple, beech, ash, walnut, buckeye, linden, wild cherry, and immense yellow poplars are abundant in the forests. In the valleys the soil is generally good, being a dark brown loam, on a sub-soil of strong clay. In the barrens the lands are level and thin. Fifty cents to one dollar would buy most of the mountain lands; farming land in the valleys from five to forty; barren lands from two to five. The principal crops in the order of their value, are corn, wheat, cotton, oats, sweet potatoes, Irish potatoes, rye, turnips and tobacco. Orchards are numerous, and dried fruit is an important article of trade. Caney Fork and Calf Killer are the principal streams. The water privileges of the couuty are abundant and very superior. There are many outcrops of coal.

WILLIAMSON COUNTY.

ORGANIZED 1799. *County-seat, Franklin*—Population in 1870—25,328, of which 11,411 are colored, Acres assessed in 1873—356,100, valued at $5,790,429; total value of taxable property, $7.629,778. Williamson is situated in the Great Basin of Middle Tennessee, and though a small portion of its western border is on the Rim, yet it is one of the richest counties of the Basin. The face of the county is undulating all over the Basin, though in some places it swells up into hills and knobs almost equal to mountains. The water-shed is from the south-east to the north-west. There is a ridge commencing in Rutherford county, running south-westerly, and gradually sinking into the general level, about six miles from Franklin. The northern face of this ridge empties its waters into Mill creek, and the valleys of this creek and its tributaries are exceedingly fertile. No amount of cultivation seems to exhaust them. The uplands are also good, except the cedar glades. A fine belt of cedar traverses this county. The "knobs" are really mountains, in height, but bottoms in fertility. They are heavily clothed with poplar, ash, oak, walnut and wild cherry, and the soil is a deep black loam, and although so steep that it is difficult to walk up, yet they are very thickly settled, and the produce is really astonishing. Spurs run out from the main ridge, and between them are valleys or coves of exuberant fertility. The valleys and foot hills of Harpeth river constitute nearly the whole of Williamson couuty, and the soil of these valleys is equal to that of any county, producing large quantities of cotton, corn, millet, wheat, oats, rye, clover, hemp, and some tobacco; blue-grass grows well. In the center of the Harpeth Valley is Franklin, the county-seat. On each side of South Harpeth is the great Rim of Middle Tennessee. The timber here is very dense. Almost all of it is white oak, though in some parts a fine growth of poplar and chestnut stands. The trees are very large. Lands here sell from twenty-five cents to two dollars per acre. In the southern part of the county, land readily brings fifty-dollars; in the south-eastern, about fifteen to twenty; in the Mill creek Valley, about fifteen to forty; and around Franklin, and to Brentwood, from forty to seventy-five, and even one hundred dollars have been paid. This is, however, on liberal time. Cedar lands sell for from fifty to two hundred dollars per acre, according to convenience to rich land. The Nashville and Decatur Railroad passes through the county, and there are seven macadamized roads passing throughout the length of the county. Franklin, eighteen miles from Nashville, has a population of about 1,800. There are twelve other villages or towns.

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WILSON COUNTY.

ORGANIZED 1799. *County-seat, Lebanon*—Population in 1870, white, 18,544; colored, 7,331; indians, 6; total, 25,881. Acres assessed in 1873—354,550, valued at $5,135,351; total value of taxable property, $6,691,164. The county by actual survey contains 578⅛ square miles. Wilson ranks among the best counties of the Central Basin. The lands are based almost wholly on limestone. The county has the Cumberland river on its northern side. The surface, summarily, outside of the valleys, of which there is a good supply, may be said to be rolling, with often high hills and ridges in the eastern part. The county-seat, Lebanon, is surrounded by a circle of moderate hills, the area within being a depression or basin, in the center of which is the town. From the town to the hills, in any direction, is from three to four miles. The average elevation of the county above the sea is from 500 to 600 feet. There is very little waste land. With the exception of a few cedar glades and some rocky points, all can be cultivated. It is a rare circumstance to see old turned out fields. The soil of the county, excepting those of alluvial bottoms, and a dark cedar soil sometimes met with, is mulatto-colored, warm and rather sandy. The crops in the order of their importance, are corn, wheat, oats, hay and barley. In addition to these are produced in considerable quantities, tobacco, cotton, potatoes, both sweet and Irish, and sorghum. Small quantities of clover and grass seed, and rye may be added to the list. Blue-grass grows well in many parts of the county. Stock-raising is largely engaged in by the farmers. The prices at which lands are held in Wilson are estimated to be, per acre, as follows: best improved bottom lands, sixty dollars; best improved uplands, forty dollars; medium bottom lands, twenty-five dollars; medium uplands, fifteen dollars; inferior uplands, eight dollars. The timber of the county is very valuable. Oak, ash and hickory timber, besides large forests of cedar gives great value to the forest products. Cumberland University is located at Lebanon. The Tennessee and Pacific Railroad has its terminus at the same place. Produce finds an outlet by this road and by the Cumberland river. Seven macadamized roads traverse the county in various directions. Lebanon has a population of 2,000. There are numerous other villages scattered through the county.

WEST TENNESSEE.

West Tennessee, extending from the Tennessee river to the Mississippi, embraces twenty counties, and has an area, if we include the whole of Hardin county, of 10,700 square miles, or about one-fourth of the entire area of the State. It had a population in 1870 of 367,576, of which 127,738 were colored. The number of voters in 1871 was 85,440, including 26,757 colored. The number of acres of land assessed in 1873, exclusive of town lots, was 6,316,300, valued at $63,217,856, or over $10 per acre. The entire value of taxable property is $107,633,035. West Tennessee has in operation 713 miles of railway, or about seven-sixteenths of all in the State. While in territorial extent it is but a fourth of the whole State, it has over one-third of the wealth and nearly one-third of the population.

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There are three natural divisions in West Tennessee:

1. The Western Valley of the Tennessee river.
2. The Plateau Land, extending westward to the Mississippi bottoms.
3. The Mississippi Bottoms.

The first division includes the counties of Hardin, the eastern parts of Decatur, Benton and Henry. Bounding this division on the west is a high bold ridge, known as Tennessee Ridge, the water-shed between the Tennessee and the Mississippi rivers. This ridge has an elevation of 600 and sometimes 700 feet above the sea. It is by far the roughest part of West Tennessee, and is valuable principally for its timber, but a few spots occur that are well adapted to cultivation. This main ridge sends out towards the Tennessee river on the east a succession of minor ridges, some of which terminate in bluffs on the Tennessee. Some of these ridges before reaching the river flatten down so as to give a better agricultural country. The general slope of the Western Valley is toward the north, while that of the Mississippi river is toward the south, thus denoting a warped surface to West Tennessee. The elevation of high water of the Tennessee at Hamburg is 392 feet, while at the crossing of the Northwestern railroad it is 357, which shows a fall of about four and a half inches per mile. The valleys between the ridges making out from the Tennessee ridge eastward are generally in cultivation and some of them have rich productive soils.

The second division is the Plateau or Slope of West Tennessee which differs greatly from the Valley of the Tennessee and partiularly in two features: 1. In having no hard rocks excepting in a few localities, and, 2, in having a more level surface. Sand, too, prevails everywhere, and the soil, though tender, is very productive. The absence of a clayey subsoil makes horizontalization a necessity for the preservation of the soil. Hundreds of acres have been exhausted and are beyond remedy. The entire area has this distinctive feature, that though there are hills and valleys to be seen in every county, its general character is that of a broad plateau. Especially fringing its eastern and western boundary lines, is the hilly country to be found, the hills being, as before stated, the minor ridges extending eastward to the Tennessee Ridge, and on the west the Mississippi Bluffs, which reach throughout the State, from north to south, on a line almost parallel with the Mississippi river. It is very difficult to estimate correctly the average elevation of so comprehensive a section as that of the Plateau of West Tennessee. Its elevation is, in the southern part of the division, between 500 and 600 feet above the sea, and in the central and northern part, from Jackson northward along the Mobile and Ohio Railroad, it becomes less, ranging from 400 to 500 feet. It also appears that in going toward Memphis the elevation is reduced to a level considerably below 400 feet. (Geology of Tennessee, page 117.)

The 3d division is the Mississippi Bottom. This is just what its name

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indicates, a bottom lying on the banks of the Mississippi river. The whole of this bottom is a low and great alluvial plain, which, at many points, is below the high water level of the Mississippi, differing much in its general features from any other large section of the State. It is true along the banks of the Tennessee river there are a few bottoms which present features somewhat similar to those presented in this section, but they are on a limited scale, and imperfectly foreshadow what is found there. A very considerable proportion of the area embraced in the bottom is covered with wild, dark and heavy forests, in which are found even such wild game as deer and bear. Considered as an agricultural section, it is especially attractive, though its resources are still in a very undeveloped condition. This division of West Tennessee embraces about 900 square miles. The general surface of this division coincides very nearly with the high water level of the Mississippi river. Its general elevation on the northern boundary of the State may be placed approximately at 295 feet above the gulf, and on the southern boundary, below Memphis, at about 215, the fall in this distance being therefore eighty feet.

The *soils* of West Tennessee are as varied as its topographical features. For instance, the bottom lands on the Tennessee river generally consist of a deep, dark, rich, alluvial soil, which rests upon a clay sub-soil, and wherever the lands are not subject to overflow they produce excellently well in corn and cotton, and where there is a pretty good mixture of sand, the grasses generally do well. The highlands of the Western Valley are much less productive than the bottoms. In color they are generally much lighter, and they rest upon a clay sub-soil, which is either whitish, yellowish or red. They produce tolerably well when planted in corn, cotton, tobacco, and especially well when sowed in grass, provided there is not too much sand in the soil. The general character of the soil in the Plateau, or Slope of West Tennessee is pretty much the same. Of course it differs materially in color in different counties, or even in districts of the same county, but everywhere it is mellow, mixed with more or less sand, impregnated with siliceous matter, and susceptible either of the highest state of cultivation, or, in the hands of careless and ignorant farmers, on account of its very mellowness, of being very soon made comparatively worthless. Much of the area of the Mississippi Bottom is covered with lakes, bayous, lagoons, swamps, marshes, etc., and much of what remains is covered with heavy timber, but elsewhere the soil is a dark, rich alluvial, very deep and everlasting. Indeed, it is difficult to understand how even a careless or ignorant farmer can ever render this soil entirely worthless. By surface plowing only, it may not produce well after a few years, but it will even then require only a thorough "sub-soiling" or deep plowing to make it as productive as ever. This section of country is destined in time to become the agricultural paradise of Tennessee. At present, however, owing to the immense size of its timber, which renders it extremely difficult to get it in a state of cultivation, but a small proportion of it is being worked at all.

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Timber. In every county in West Tennessee there is an abundance of timber, including all the varieties found in the west and south-west. The best timber, however, is poplar, the different varieties of oak and gum, hickory, ash, cypress and walnut. No portion of the State can compare with Dyer and Obion counties in wealth of timber. The forest products are very extensive and valuable. Thousands of pipe staves are shipped to Spain and France annually. Lumber sells from ten dollars to thirty dollars per thousand, the latter being for choice walnut.

Staple Crops. In the more northern counties of West Tennessee the staple products are corn, tobacco and the grasses; but in most, if not all of them, cotton, wheat and oats also are raised. The principal staple in the southern counties is cotton, though corn, wheat and oats, the different grasses, and some tobacco are raised in all of them. In addition to these crops, sweet and Irish potatoes are grown everywhere, but scarcely ever for market. In those counties where there is much sand, (as for instance in Decatur,) peanuts are raised to a considerable extent. Herds-grass and orchard-grass both grow well, and the latter is more prized by stock men than blue-grass. Clover is also a standing crop in the northern portion of this division, and is extensively grown, not only for its grazing and hay-making qualities, but also as a fertilizer.

Stock-raising. Though possessing very superior natural advantages as a stock district, West Tennessee does not rank well with the "fine stock" sections of the country. In fact, very little attention is paid to the subject of raising fine stock, and almost none to that of rearing pure breeds. Occasionally a few pure-blooded males will be found, having been introduced into a county with a view of improving the domestic breeds; but it is a rare thing to find a farmer who has turned his attention to breeding thorough-breds. Almost every farmer, however, in the northern part of West Tennessee raises a sufficient number of horses, mules, cattle, sheep, swine (common stock,) for his own purposes, and most of them raise some to sell. In every county and in almost every neighborhood, the range is good, and it really costs but little to raise and even fatten a good number of stock Around Memphis dairy farming has proved quited profitable.

Minerals. Though not so rich in mineral wealth as either of the other divisions of the State, some very rich deposits of iron ore are met with in Decatur and Benton counties. Previous to the war there were two furnaces in operation, Brownsport and Decatur. The former only has been in blast since. In Henry, Benton and Decatur counties quarries of very good variegated marble occur. The same rock is burnt into lime, which is the principal source of supply for the more westerly counties. Beds of lignite outcrop on the slopes of the Mississippi Bluffs in Obion, Dyer, Lauderdale, Tipton and Shelby. This material has been mistaken for true stone-coal, an error which has led some into expensive and vain exploration. In a number of counties beds of potter's clay abound, much of which is white. In McNairy, Hardin and Henderson a very extensive bed of "green sand" occurs.

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which supplies a good fertilizer. No part of the State has more ample facilities for transportation. Every county in this division of the State except Henderson has either direct railroad or river transportation. See article on Transportation, page 30.

BENTON COUNTY.

ORGANIZED 1836. *County-seat, Camden*—This county embraces about 400 square miles, and had a population by the last census amounting to 8,234, of which 422 were colored. The number of acres of land, exclusive of town lots, assessed for taxation in 1873, was 239,663; valued at $911,277. The whole valuation of taxable property for the same year was $1,012,619. Benton county is partly in the Western Valley of the Tennessee river and partly on the Plateau or Slope of West Tennessee, the eastern section being in the former, the remainder in the latter. The point where the Nashville and Northwestern Railroad crosses the Tennessee river is 357 feet above the sea. The average elevation is about 370 feet above the sea. Immediately about Camden, which is located very near the center of the county, the country in every direction for a distance of about five miles is gently undulating, but going east towards the Tennessee river, until the margin of the river valley is reached, there are many steep bluffs, or spurs, which fringe the valley along its entire length in the county. This valley is about, on an average, two miles wide, and not less than fifty miles long, and has a rich, alluvial soil, which is very productive. West of Camden, the county becomes more rolling, and the soil is thiner and much less productive. The county is watered by Eagle creek, Birdsong creek, Sycamore creek, Cypress creek and Rushing creek. The Tennessee river makes the eastern border of the county for a distance of fifty miles, and the Big Sandy River forms the dividing line between Benton and Carroll counties. Spring and well water are used for domestic purposes. Timber—oak principally, with some poplar, and in the creek and river bottoms some walnut. Number of farms in county, 1,165. The prices of land is very low, the following being the average: best improved lowlands, per acre, fifteen dollars; best improved uplands, ten dollars; medium lowlands, five dollars; medium uplands, three dollars; inferior lowlands, three dollars; inferior uplands, two dollars. The following will show the crops and average yield per acre: cotton, 500 pounds; corn, 25 bushels; tobacco, 700 pounds; Irish potatoes, 60 bushels; sweet potatoes, 75 bushels; peanuts, 65 bushels. The Nashville and Northwestern Railroad passes through the county, which gives ample railroad communication in addition to the water facilities furnished by the Tennessee river. Camden has a population of about 300.

CARROLL COUNTY.

ORGANIZED 1822. *County-seat, Huntingdon*—There are about 625 square miles of territory in the county. The number of acres exclusive of town lots assessed for taxation in 1873, was 352,030, valued at $3,153,880; total taxable property, $3,787,855. Around Huntingdon the country is broken, but becomes quite level on the northern and western border. The land on the eastern boundary is very much broken. The soil is generally of gray color, with a reddish sub-soil, which is very retentive of moisture. But there is a light sandy soil in various sections of the county very tender and washes easily, on which cotton does better than on the gray lands, but even on these it pays well to raise it. The principal streams are Big Sandy, Beaver creek, Crooked creek, Ready creek and Rutherford Fork. The average prices for lands in the county are about as follows: best improved land, per acre, twenty to thirty dollars; medium lands, fifteen to twenty; inferior lands, five to eight. Staple crops: corn, average yield per acre, 22 bushels; cotton, 600 to 800 pounds; wheat, 8 bushels; tobacco, 800 pounds; oats, 15 bushels; potatoes, Irish, 20 to 30 bushels; potatoes, sweet, 25 to 40 bushels. On the best soils two or three times the quantity here given can be grown. The soil is admirably suited to herds-grass; the bottoms grow millet and timothy abundantly. Fruit yields with

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moderate certainty. Good lumber can be procured in the county at from fifteen to twenty dollars per thousand feet, principally yellow poplar, but there is some red gum; the other varieties are very scarce, and but little lumber is shipped. Huntingdon has about 800 inhabitants; McKenzie at the crossing of the Nashville and Northwestern and Louisville, Nashville and Great Southern Railroads is a flourishing place of 1,000 inhabitants, and is the seat of several flourishing educational institutions. Trezevant, McLemoresville and Marlborough are thriving places. The railroad facilities are good with more in prospect. Population in 1870—whites, 14,648; colored, 4,779; total, 19,447.

CROCKETT COUNTY.

ORGANIZED 1872. *County-seat, Alamo*—The county contains about 275 square miles. The number of acres assessed for taxation, exclusive of town lots, is 163,658, valued at $2,661;121; total value of taxable property, $3,163,589. Population, 10,500, one-fourth colored. The surface of the county is generally level, being a little hilly in the northwest. The black soils of the county are very rich and productive, being almost totally destitute of sand. In the eastern part the soils are reddish and sandy. Cotton and corn are the staple crops, the yield of the first being about 700 pounds to the acre, and of the second about 35 bushels. Some wheat is raised for home consumption. Herds-grass grows well, and on some soils, clover. Peaches, grapes and strawberries are raised in considerable quantities. The following are the average prices of land in the county: best land, per acre, twenty to thirty dollars; medium land, twelve to twenty dollars; inferior land, five to twelve. The terms of sale are generally one-third cash, balance in one and two years. South Fork and Middle Fork of Forked Deer river and Pond creek are the principal streams. For a supply of stock-water, the people depend on artificial ponds, which are easily made and hold well, and upon the ponds in the beds of creeks which cease to run in summer. Many of these ponds hold water during the greater part of the year. The dependence for honsehold purposes are wells and cisterns. The Louisville, Nashville and Great Southern Railroad passes through the county. Alamo has a population of 350. Gadsden, Bells Station, Chestnut Bluff are the principal villages.

DECATUR COUNTY.

ORGANIZED 1846. *County-seat, Decaturville*—A large portion of Decatur is included in what is known as the Plateau or Slope of West Tennessee, the remaining part being in the West Tennessee Valley. The character of the country west of the Tennessee river and until the river bluffs are reached is a rich dark alluvial soil, very porous, very deep and very productive. There is a ridge, known in the county as the "shore line," which traverses the county in a north and south direction, and forms two divisions known locally as the "sand district" and the "rocky district," the former being west of the ridge and the latter being east of it. On the river bluffs limestone rocks crop out until the old "shore line" is reached. West of Decaturville the land becomes sandy with no hard rocks. The soil is mellow, productive, but thirsty. As a general rule the lowlands are planted in corn, and the uplands in cotton, wheat and peanuts. The highlands are well adapted to the growth of clover, and where there is a preponderance of sand in the soil, herds-grass and peanuts thrive especially well. Wheat generally does better in those sections of the county where there is less sand, and where the soil is stiffer than in most sandy sections. In various portions of the county, especially upon or near the ridge, are numerous glades or bare tracts of land, sometimes containing several acres, which will produce nothing in the way of vegetation, but an occasional bush or little patches of wiry grass. These glades result from the disintegration of gray and sometimes reddish marly limestones, which contain occasionally interstatified thin cherty layers. The Tennessee river washes the eastern border of the county and furnishes the only outlet. Beech river is the principal stream which passes through the county. Timber: poplar and the different varieties of oak, gum, hickory, ash, cedar, pine, sugar maple, wild cherry, walnut and some chestnut. Lumber is made and shipped by the Tennessee river. The usual prices asked and paid for land are: best improved lowlands, per acre, thirty-five dollars; second class do, twenty dollars; third class do, twelve dollars; best unimproved, twelve dollars; second class do, eight dollars; third class do, two dollars. These lands include only the tillable

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lands of the county. There are very rich river bottom lands, which are subject to annual overflow, that can be purchased at from three to five dollars per acre, but they are worthless except for the timber which is upon them. Average yield per acre in corn is 30 bushels; cotton (in seed) 700 pounds; wheat, 17 bushels; peanuts, 25 bushels. Some attention is paid to the growing of grasses and such roots as are generally grown in West Tennessee. Iron ore of a superior quality is found near the Tennessee river. One furnace with a capacity of 6,000 tons per annum is in operation. Number of acres returned for taxation in 1873—522,690, valued at $3,214,148; total taxable property, $1,054,846. Population in 1870—7,772, of which 1,056 were colored.

DYER COUNTY.

ORGANIZED 1824. *County-seat, Dyersburg*—This county is bounded on the north by the counties of Obion and Lake, on the east by Gibson and Crockett, on the south by Haywood, Crockett and Lauderdale, and on the west by the Mississippi river. It has an area of about 600 square miles. The number of acres assessed for taxation in 1873 was 327,690, valued at $3,214,148; the assessed valued of property is $4,072,081. Population—whites, 10,767; colored, 2,822; total, 13,589. Dyer is one of the most fertile counties in the State. About one-half of it lies in the Mississippi bottom, and the other on the Slope or Plateau of West Tennessee. That in the bottoms is very flat while the highlands are undulating. The soil is generally a dark rich loam, with a sub-soil of yellow clay, but in the western portion there is considerable sand and the soil is much lighter in color. The bottom lands are alluvial and the soil remarkably deep and productive. The county is well watered by Obion and Forked Deer rivers and the latter is navigable as high up as Dyersburg, the county-seat. No county in the State is better supplied with timber, the best being poplar, hickory, walnut, cypress, the different varieties of oak, chestnut and beech, and the other kinds usually found in West Tennessee. Some of the poplars rise to a height of sixty or seventy feet without a limb, and will measure six or seven feet in circumference. Oaks, hickories and walnuts grow to an immense size, and even the sassafras here attains the dimensions of the largest trees of the forest. First class improved lands are worth thirty dollars per acre; second class do, twenty dollars; third class do, ten dollars; first class unimproved lands, fifteen dollars; second class do, ten dollars; third class do, five dollars. There are considerable bodies of land in the county which are subject to annual overflow, and which can be purchased at from fifty cents to two dollars per acre. The usual terms of sale are, one-third cash, the balance in one and two years, with a lien reserved on land. The staple crops with the average yield per acre are, corn, 35 bushels; cotton, 950 pounds; tobacco, 1,000 pounds; wheat, 12 bushels; oats, 17 bushels; hay, 3,000 pounds. The cotton shipped from the county ranks in the market with the best Tennessee cotton, and the tobacco, most of which is shipped to New Orleans, ranks well as a heavy shipping tobacco. The Memphis and Paducah Railroad will pass through the county. There is no county in the State with fairer prospects for the future. Immigrants are greatly needed.

FAYETTE COUNTY.

ORGANIZED 1824. *County-seat, Somerville*—This is one of the largest and one of the best counties in the State, and comprises over 700 square miles. The number of acres, exclusive of town lots, assessed for taxation in 1873, was 438,652, valued at $4,910,805, or at little over $11 per acre. The whole amount of taxable property in the county amounted in 1873 to $6,343,325. Population in 1870—26,145, of which 16,987 were colored. The country bounded on the east and north by Big Hatchie, the Wolf on the south, and the Mississippi on the west, is said to be the most productive tract of upland cotton land on the globe, in area 1,400,744 acres. In the center of this tract lies Fayette county, in shape nearly square. The topographical features are not strongly marked. The northern portion is slightly undulating; the middle and western a little more inclined to be hilly, with extended plateaus; the south-east portion is more hilly, with very fertile valleys. The extreme southern part is an unbroken level, being the bottoms of Wolf river, which is the largest stream in the county, and navigable at certain seasons. It runs east and west. The North Fork of Wolf rises in the eastern part of the county and joins the Wolf at Moscow. The Loosahatchie also rises in the eastern

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part of the county, runs nearly west through the center, and empties into the Wolf at Memphis. The other streams are Bear creek and Beaver. The soils of Fayette county are almost uniformly sandy, with more silicates in those in the southern portion, and a gradual increase of clay in the northern. That of the entire county is peculiarly adapted to the growth of cotton and other textile plants. It is quick, and produces satisfactory crops of all the cereals. It washes easily. Timber is scarce; red oak, walnut, poplar, hickory; in the bottoms, beech, overcup and white ash. Farms are large. Cotton is the commercial crop. Indeed, almost all other crops are neglected for this. The prices of farming land range from three to forty dollars per acre, averaging about $9.50. The price per acre is governed mainly by location and condition of land. Large quantities of hillside lands having been wholly neglected during the war have washed into gullies and ravines, the top loam being swept into the valleys. These only were first cultivated, though improvements are again reaching up the hillsides and reclaiming them. These neglected lands can be bought for from five to ten dollars per acre, and will produce 500 pounds lint cotton, or fifteen to twenty-five bushels of corn without fertilizers, when properly treated. Apples, peaches, pears, plums, cherries, etc., thrive wonderfully, except winter apples. The fruit has a peculiarly delicious saccharine flavor, particularly the peaches. Nearly every variety of grapes do exceedingly well, as proved by amateur growers. The scuppernong grows in great abundance and perfection, never rotting. Common schools are well sustained. The Memphis and Charleston Railroad with a branch to Somerville, supplies means of transportation.

GIBSON COUNTY.

ORGANIZED 1823. *County-seat, Trenton*—The county comprises about 600 square miles. Acres assessed, 366,105, valued at $5,618,695; total value of taxable property, $7,471,389. Population in 1870—25,666, of which 6,865 were colored. Since that time about one-seventh of the county has been taken off and added to Crockett county. Between the different streams, there are generally low ridges that divide the valleys, but they are neither very distinctive nor very prominent. All of Gibson county is on the Plateau or Slope of West Tennessee, in which there are very few or no regular strata of hard rock; occasionally, however, local or limited beds or blocks of coarse reddish or brown sandstone are met with. The soil upon the surface is loam, which is dark, ranging from a mulatto color to black, and varies in depth from six to twenty-four inches. Immediately below this loam is a yellowish clay, which varies in depth from eighteen inches to four feet. Below the clay is sand, and then "hard pan" difficult to be dug with picks. The darker lands of the county, which are principally embraced in its western half, are more favorable to the growth of cotton than the others, though all the good lands in Gibson county grow corn and cotton well. The soil of Gibson county generally is very mellow and has in it a considerable quantity of siliceous matter. It is easily tilled, but where there are any very preceptible elevations, it is subject to be washed away, and requires good handling to make it durable. The county is watered by the tributaries of Forked Deer and Obion rivers. The timber is not equal to that of Dyer and Obion counties, but exists in sufficient abundance for the wants of the county. There is much land for sale. The prices asked are: for best uplands, per acre, fifteen to twenty dollars; best lowlands, twenty to twenty-five dollars; medium uplands, ten to fifteen dollars; medium lowlands, fifteen to twenty dollars; inferior uplands, five to ten dollars; inferior lowlands, ten to fifteen dollars. The overflowed lands, including about 3 per cent. of all the lands in the county, generally sell for from three to five dollars per acre. Cotton is the principal staple, though corn, wheat and hay are raised in considerable quantities. The land produces tobacco well, but very little is raised. There are other products which are raised in considerable quantities, but they cannot be classed with the staples. The average yield of cotton, per acre, is 800 pounds seed; corn, 30 bushels; tobacco, 900 pounds; wheat, 7 bushels; hay, 1,500 pounds. Timothy and herds-grass grow well and so do fruits of various kinds. At present there are three railroads passing into and through the county—the Mobile and Ohio, the Memphis and Louisville, and the Mississippi Central. The Tennessee Central, which is to run from Fulton, on the Mississipp river, and tap the Nashville and Northwestern Railroad at Huntingdon, will pass through Trenton, thence onward to Huntingdon; it is now under contract. Trenton, the principal town, has a population of 2,700. The public schools are among the best in the State.

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HARDEMAN COUNTY.

ORGANIZED 1823. *County-seat, Bolivar*—Acres assessed in 1873—398,826, valued at $3,339,054; total value of taxable property, $4,449,059. Population in 1870 was white, 11,220; colored, 6.854; total, 18,074. The county is included in the Slope or Plateau of West Tennessee, and is one of the best counties in that natural division of the State. Around the county-seat the surface of the country is quite level, and also on the western border. The other parts are slightly undulating, with alternations of rich creek valleys. The soil is a dark, mellow, siliceous loam, and highly productive. The sub-soil is a red clay. On the ridges the soil though rich is thin, on the level lands its depth will average five inches, and in the valleys eighteen. Big Hatchie passes diagonally through the county, and with its tributaries furnishes every part of it with water. Wells and cisterns are easily made, there being no solid rock in the county. The water is freestone and chalybeate. The best varieties of timber are white oak, red oak, hickory, gum, poplar, and much pine. Large quantities of lumber are shipped annually as staves, for the European markets, and a great many cross ties are annually cut for railroad purposes. Saw-mills are numerous. The lumber is of pine, cypress, poplar and oak. Best improved lands, per acre, are worth twenty-five dollars; medium do, ten dollars; inferior do, five dollars; the average being about fifteen dollars; best unimproved lands, fifteen dollars; medium do, seven dollars and fifty cents; inferior do, one dollar; the average being about eight dollars. Corn, cotton, peas, and potatoes are grown more extensively in the county than any other crops, though there are also yearly crops made of tobacco, wheat, oats, rye and beans, and a considerable quantity of clover is also grown. The average yield per acre, of cotton in seed is 800 pounds, corn, 20 bushels; wheat, 12 bushels; tobacco, 900 pounds; oats, 25 bushels; hay, 1 ton; Irish potatoes, 150 bushels; sweet potatoes, 200 bushels. The cotton shipped ranks generally as "strictly middling," and the tobacco is said to be of a superior quality, though the quantity is quite limited. As a fruit region, Hardeman takes a front rank among the West Tennessee counties. Stone fruits, seed fruits and berries do well in every neighborhood. Apples are the most certain fruit, but peaches also thrive. Memphis and New Orleans are the principal markets. The former is reached by the way of the Memphis and Charleston Railroad, which passes through the county, and also by the way of the Hatchie and Mississippi rivers, the former of which is navigable to Bolivar and empties into the Mississippi. New Orleans is reached by the Mississippi Central Railroad, which passes through the county, and also by the way of the Hatchie and Mississippi rivers.

HARDIN COUNTY.

ORGANIZED 1819. *County-seat, Savannah*—Population in 1870 was 11,768, of which 1,447 were colored. Acres assessed in 1873—317,656, valued at $1,609,050; total value of taxable property, $1,930,970. Variety is the leading characteristic of this county, and this is true of its topography, geology, soils and timber. Lying partly on the Highland Rim of Middle Tennessee, partly in the Western Valley of the Tennessee, and partly on the Slope or Plateau of West Tennessee, it partakes of the characteristics of all three divisions. The valley of the Tennessee river extends in a northerly direction through the county, and of course is a leading feature of its topography. This valley is comparatively rough and broken. There are some excellent bottoms on this river, but the quantity of good land is not so great as one should expect to see bordering such a magnificent stream. Four large creeks from the east and eight from the west empty into the Tennessee river, which supply the county bountifully with living water. The best soils are those of the bottom lands, and many of these are unsurpassed in fertility. The soils of the Tennessee bottom, on the west side of the river, are of three distinct kinds, arranged in strips nearly equal in width and parallel with the river. The first of these next to the river is a deep black alluvium, highly productive; the second is sandy, and in point of productiveness is about equal to the uplands; the last is swampy, bluish in color, "crawfishy" and cold, the home of greenbriers, but it is heavily timbered. In the southern end of the county on the west side sandy hills prevail. The country is rough and the hills are covered with pine timber and oaks. These hills extend seven miles down the river, after which the country becomes more level and the soils better, running into the Green Sand Belt. The soils in this hilly region wash easily by reason of the predominance of sand, and are moderately productive. The soils on the creeks on the east side of the river are limestone, and the best in the county,

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and especially those in the bottoms lying on Indian creek, which cover in the aggregate about twenty-two square miles. The soils of the uplands on the east side of the river are thin and unproductive. Much of this upland is high and rolling, but covered with an abundance of excellent timber. Three miles east of Savannah there is a belt of flat or barren land. It has a white sub-soil, shading off into yellow. Some of this land is quite productive when first opened, but its fertility is soon exhausted. This flat region covers about fifty square miles. The summits of the ridges in the eastern part of the county have sometimes a tolerably good soil, but more frequently a thin one. On many of the ridges chestnut oaks abound, and supply much bark for tanning purposes. There are fine forests of pine timber in the southern part of the county. The value of the lands in Hardin county, is for first quality, improved, per acre, one hundred dollars; second quality, fifty dollars; third do, twenty dollars; fourth do, six dollars; fifth do, fifty cents. The principal crops of the county are corn, cotton, wheat, oats, peanuts, Irish and sweet potatoes and hay. Fruit (especially apples and peaches) is an important product of the county. Figs ripen in the open air. Plums are not troubled with curculio. The experiments made with the pear have proved entirely satisfactory. Nuts, blackberries, raspberries, etc., are to be found everywhere. Muscadines grow with unparalleled luxuriance on river bottoms. Grapes have been grown with success on the flat barren lands. On the best river bottoms the yield of corn reaches sometimes 75 and 100 bushels per acre. The best lands for the production of cotton are on Mud creek, where the quantity raised is sometimes as much as 1,200 pounds of seed cotton per acre. The average yield of wheat, which is sown in November and December, is ten bushels per acre. Irish potatoes yield bountifully on the black sandy soils. There are no greater inducements offered by any county than this for immigrants. The outlet is by the Tennessee river. Hydraulic rock is abundant as well as a siliceous iron ore. Some lead has been found. Savannah has a population of 700 and is situated on this river.

HAYWOOD COUNTY.

ORGANIZED 1824. *County-seat, Brownsville*—This county comprises about 460 square miles, and occupies with Madison a central position in West Tennessee. Acres assessed in 1873—296,958, valued at $3,700,937; total taxable property, $5,697,559. Population—white, 9,459; colored, 11,661: total, 21,120. This county is on the Plateau or Slope of West Tennessee. A ridge which is the water-shed between the Forked Deer and Hatchie rivers, traverses the center of the county from east to west. From the crest of this ridge the country slopes to the southern border of this county on the one hand, and to the northern on the other. There are but few hard rocks in the county. Occasional masses of sandstone are met with, which answer the purposes of a building stone. In many places in the county are found beds of sand, associated to some extent with clay and loams. In fact, the Lagrange Sands and the overlying drift, the Orange Sand, are almost the only formations found in this county. The Lagrange formation appears as a stratified mass of yellow, orange, red or brown, and white sand, with an occasional interstratified bed of white, gray or variegated clay. The best cotton lands in the county rest upon these sand beds, the soil being a mellow, siliceous loam, which is easily tilled, but is easily washed away, requiring careful draining and general good farming to keep it up. The prevailing color of the soil of this county is a dark gray, with a yellowish sub-soil, upon a bed of clay. The county is watered, for the most part, by the Hatchie and Forked Deer rivers and their tributaries. Lakes are numerous. There is an abundance of good timber all over the county, the different varieties of oak being regarded as the best; there are also poplar, gum, and along the rivers cypress and other varieties. The principal undergrowth is pawpaw and hazlenut. Average price of best lands, per acre, twenty-five dollars; medium, twenty dollars; inferior, seven dollars and fifty cents. There is very little inferior land in the county. The staple is cotton, but a sufficiency of corn to supply the home demand is generally raised. Much more attention is paid to the growing of wheat than to the growing of any of the smaller grains, though some attention is paid to oats. Yield of cotton, per acre, 750 pounds; corn, 24 bushels. The Louisville, Nashville and Great Southern Railroad passes through the county. Brownsville has about 6,000 inhabitants, and has grown rapidly since the war. It has a large cotton factory in operation, and ships annually about 20,000 bales of cotton.

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HENDERSON COUNTY.

ORGANIZED 1821. *County-seat, Lexington*—It embraces about 590 square miles, and contained a population in 1870 of 14,517, of which only 2,408 were colored. Acres assessed for taxation in 1873—374,287, valued at $1,958,128. The census gave as the whole number of acres in the county 330,132, of which 92,250 were unimproved. Total taxable property amounts to $2,311,338. The surface is diversified. The Tennessee ridge with its outlying hills about five miles wide, extends north and south through the county, and forms the most picturesque portion of West Tennessee. The lands east and west of the ridge are slightly undulating. The soil on the ridges is thin, but in level places, even upon the ridges the soil is productive. Several important streams rise in the county, among others, Beech river, Big Sandy, and some of the tributaries of the Forked Deer. The formation is cretaceous mainly, and exhaustless beds of green sand exist in the county suitable for making fertilizers. First-class improved lands are worth per acre, twenty-five dollars; second-class do, eighteen dollars; third-class do, eight dollars; first-class unimproved, eighteen dollars; second-class do, seven dollars; third-class do, three dollars. The average yield per acre, in corn, is 30 bushels; wheat, 10 bushels; oats 15 bushels; cotton, (in seed) 700 pounds; tobacco, 800 pounds; hay, 3,000 pounds. There are no railroads. Lexington is the principal town and has about 250 inhabitants.

HENRY COUNTY.

ORGANIZED 1822. *County-seat, Paris*—It embraces about 570 square miles, and had a population in 1870 of 20,380, of which 5,204 were colored. Acres assessed for taxation in 1873 357,705, valued at $2,812,860; total taxable property, $3,656,340. The Tennessee Ridge which divides the waters running into the Tennessee river and those running into the Mississippi, pass through the central part of the county, entering near Macedonia, runs north, and passes out near Conyersville. Along the course of this ridge there is a narrow strip of land that is hilly. It is well adapted to the growing of apples, peaches, pears, and the grape. East of "the ridge" the surface soon becomes level, or gently undulating, the soil being a light sandy loam, underlaid with a stratum of sandy or gravelly clay. The more level uplands have good depth of soil, are underlaid with red clay, more or less mixed with sand, and are capable of indefinite improvement. West of the "divide" the surface, at first gently sloping, soon becomes quite level, the soil more compact, often mixed with gravel, underlaid with red, and in some spots, whitish clay, exceedingly fertile, and is as pretty farming lands as can be found in Tennessee. Improved lands are worth from ten to fifty dollars per acre, and unimproved from five to twenty. The average price for good improved land is about twenty to twenty-five dollars. All kinds of oaks abound—white oak for sawed lumber for fences, floors, laths, felloes, spokes, etc.; post oak for posts and railroad ties, and the red oak for boards, rails, tanbark, etc. There is an abundance of the finest of hickory, suitable for axletrees, spokes, hubs, handles, hoops, etc., also poplar, gum, beech, cherry, and chestnut for building and cabinet lumber. There are also elm, ash, birch, maple, locust, mulberry, hornbeam, dogwood, redbud, haw, sassafras, plum, pawpaw, persimmon, hazel, huckleberry, etc. Some of the white oaks will measure six and eight feet in diameter, three feet above the ground. The soils are well adapted to the production of cotton, tobacco, corn, wheat, rye, oats, clover, the grasses, peas, beans, potatoes, sorghum, etc. The great staples are cotton and tobacco, both of which grow nearly or quite as well here as in any portion of the State. Clover has been sown extensively since the war and does well. Means of transportation are furnished by the Tennessee river, and Louisville, Nashville and Great Southern Railroad. Paris has a population of 2,000. There are several manufactories of cotton and tobacco in the county.

LAKE COUNTY.

ORGANIZED 1870. *County-seat, Tiptonville*—It is the extreme north-western county of the State, and is hemmed in by the Mississippi river on the west and Reelfoot Lake on the east. It comprises about 135 square miles. The number of acres assessed for taxation is 84,360, valued at $755,883; total value of taxable property, $908,386. The population in 1870 was 2,428, of which 393 were colored. All of Lake county is in what is called the Mississippi Bottoms, and belongs to the most recent formation.

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The county is heavily timbered with cypress, oaks and cottonwood. The surface is almost a water level; soil deep black, exhaustless and impregnated with lime, adapted to the growth of cotton, corn, potatoes and all the grasses. The yield of these crops is almost incredible. As much as 2,500 pounds of seed cotton have been grown on one acre, and other crops in like proportion. Land varies in price from five to fifty dollars per acre. This county has a larger proportion of rich soils than any other in the State. The Mississippi river furnishes the only outlet.

LAUDERDALE COUNTY.

ORGANIZED 1836. *County-seat, Ripley*—It has an area of about 430 square miles. The amount of land assessed for taxation in 1873, exclusive of town lots, was 272,445 acres, valued at $2,442,623, or nearly $9 per acre. The total value of taxable property is $2,829,185. The population in 1870 was 10,838, of which 3,484, or not quite one-third were colored. The eastern part of Lauderdale is on the Plateau of West Tennessee; the western part is low, and lies in the Mississippi Bottom, and each part has the characteristics of three natural divisions as given on page 7. Soils described on pages 15 and 16. The county is washed on the west by the Mississippi river, which with the Paducah and Memphis Railroad furnishes an outlet for the products of the county. The Hatchie and Forked Deer rivers with their tributaries supply the county well with water. The timber trees are poplar, white oak, hickory, ash and cypress. Best improved lands are worth per acre, thirty-five dollars; second-class do, twenty-five dollars; third-class do, ten dollars; inferior do, five dollars; best unimproved, fifteen dollars; second-class do, ten dollars; third-class do, five dollars; inferior do, two dollars and fifty cents. There are considerable bodies of land in the bottoms which are subject to overflow, and which can be purchased at from fifty cents to two dollars and a half per acre. Cotton is the staple crop, and the average yield for the county is 750 pounds in the seed, per acre. Corn enough is not raised for home consumption.

MADISON COUNTY.

ORGANIZED 1821. *County-seat, Jackson*—It has an area of 575 square miles. Population in 1870—28,480, of which 10,152 were colored. A small fraction has since been taken off. Acres assessed 361,842, valued at $3,863,124; whole value of taxable property, $6,248,727. This county lies on the Plateau or Slope of West Tennessee. The surface is undulating; the soil sandy and slightly calcareous, tender and easily washed, dark chocolate in color and highly productive. No hard rocks except local masses of ferruginous sandstone. The county is watered by the tributaries of Hatchie and Forked Deer rivers. The timber is oak and hickory, with some beech, ash and poplar. Productions—cotton, corn, wheat, timothy, herds-grass and some clover. Peaches, pears and grapes grow and yield well. Cotton is the great staple; average yield about 600 pounds in seed. Average price of best lands, per acre, is twenty-five dollars; medium, twelve to twenty dollars; inferior, five to twelve dollars. There are two railroads in operation in the county, the Mobile and Ohio, and the Mississippi Central, both of which run through the suburbs of Jackson. This only has a population of 7,000 inhabitants, and does a business amounting to over $7,000,000 annually. This one of the richest counties in West Tennessee.

McNAIRY COUNTY.

ORGANIZED 1823. *County-seat, Purdy*—It comprises about 645 square miles, or 412,800 acres. Exclusive of towns lots, the number of acres assessed for taxation is 402,076, valued at $1,753,550, or $4.33 per acre. The whole value of taxable property for the year 1873 was $2,161,269. Population in 1873—12,726, of which 1,500 were colored. Topographically, this county is very much like Henderson, and belongs to the cretaceous formation. The Tennessee Ridge passes throug it. The soil is mellow and sandy in the northern and eastern parts of the county and of a light hue. In the south the soil is dark and rich, and in west brown and highly productive. The sandy soils are best for cotton. The green sand is found in this county to a larger extent than elsewhere in the State, (see page 16.) In the western part of the county pine timber pre-

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vails; in the other sections oak, hickory, ash, chestnut, etc. The price of best bottom lands, per acre, is twenty to thirty dollars; medium do, fifteen to twenty-five dollars; inferior do, ten to fifteen dollars; best uplands, fifteen to twenty dollars; medium do, eight to twelve dollars; inferior do, three to six dollars. The staple of McNairy county is cotton, though a good deal of corn is raised; some wheat and tobacco are also grown. Irish and sweet potatoes are raised for family use. The Mobile and Ohio Railroad passes through near the center of the county, from north-west to south-east. The Memphis and Charleston passes through the extreme south-western districts from west to east, and a narrow gauge road is being built from Memphis, which will pass through the town of Montezuma. Purdy has a population of 500.

OBION COUNTY.

ORGANIZED 1823. *County-seat, Troy*—This is one of the northern tier of counties of West Tennessee, and is one of the most fertile in the State. Its entire superficial area embraces 560 square miles, but at least 36 square miles are covered by Reelfoot Lake, which separates this county from Lake on the west. The number of acres assessed for taxation is 296,278, valued at $3,631,149, or $12.26 per acre. The entire value of taxable property is $4,529,800. The population of the connty in 1870 was 15,584, of which 2,182 were colored. Except in the western part of the county bordering the lake, the surface is level or slightly rolling. Near the lake it rises in sharp ridges with long narrow valleys between. The soil may be put into three classes, according to color: the black, mulatto and ashen. The black and mulatto are about equal in fertility, the former being preferred for corn and orchard-grass, the latter for cotton and small grain. While the black yields a larger number of pounds of tobacco per acre, the mulatto will grow a silkier and finer article. Both are well suited for the growth of timothy, clover and the grasses generally, though for the growth of timothy and herds-grass the ashen colored soil is specially adapted. The black is very porous, drains easily, and for that reason may be worked earlier in the spring. It also has a greater depth. The mulatto is quick, lively, generous, but not deep. It holds fertilizers well, and is altogether very desirable. The ashen needs to be drained, (see pages 15 and 16.) This county is noted for its superior timber trees, which consist of poplar, oak, gum, beech, walnut, sugar tree, cypress and hickory. The undergrowth is cane and pawpaw mainly. Every product grown in the State can be grown with profit in Obion. Corn, wheat, oats, tobacco, cotton, rye, buckwheat, clover and all the grasses do well. The dense growth of the timber and the difficulty of opening land have retarded agricultural development in this county. Lands range in price, improved and unimproved, from two to fifty dollars per acre. Obion river and its tributaries water the county. Reelfoot Lake extends for a distance of eighteen miles on the western border. Union City is the principal town with a population of 2,500. The railroads are the Nashville and Northwestern, Mobile and Ohio, and Memphis and Paducah. All pass through the heart of the county.

SHELBY COUNTY.

ORGANIZED 1820. *County-seat, Memphis*—This is the wealthiest county in the State, and one of the largest. It occupies the extreme south-western corner, and embraces an area of 720 square miles. The number of acres assessed for taxation, exclusive of town lots, for 1873, was 442,534, valued at $9,546,311, or $21.57 per acre. The number of town lots was 8,455, valued at $24,057,937. The total valuation for 1873 was $38,553,951, or over one-third of the taxable property in West Tennessee, and over one-eighth of all the taxable property in the State. The population in 1870 was 76,378, of which 36,540 were colored. The general surface of the county is that of a gently undulating plain, interspersed with some half dozen creeks, two rivers, and a number of water-courses, great gullies, dry half the year, miscalled bayous, which serve to rapidly drain off the excess of rainfall. There is a reasonable amount of flat alluvial soil along the creek bottoms and the rivers, especially that part facing the Mississippi river in the south-western quarter of the county. The hills or rolling lands are usually of a clay loam, resting on a reddish-yellow brick clay. The alluvial soils, composed of vegetable mould and sand, are as rich as any in the world. Some of them have produced fifty consecutive crops of corn and cotton, yet show but little signs of impoverishment. There is a moderate amount of warm, sandy soils, suitable for any sort of crops which

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flourish on such. In and around the village of Raleigh is a series of high, dry, sandy hills, most admirably suited, when fertilized and properly tilled, to produce orchard products, berries, melons and garden stuffs. Cotton is the staple of the county. The cabbage and cauliflower are excellent, and of course the warm weather, continuing so long, matures in fine style lima beans, melons, cucumbers and other garden products native of the sub-tropical countries. Grains, including all food crops for man and beast, and also the root crops, do finely.

The timber consists of walnut, ash, cypress, dogwood, maple, oak, poplar, hickory, locust, gum, cottonwood, etc. Around the city of Memphis the prices of lands vary from $500 to $3,000 per acre. In the more remote, or properly the staple farming portions of the county, the cost of improved places is from $10 to $50 per acre. Timber lands near the city are very costly, but farther away and not near a railroad, or a navigable stream, they may be purchased usually for from $5 to $10 per acre. Under the present culture, the old uplands, fifty years under culture, average the yield of about 200 pounds of cotton passed through the gin and ready to bale for export; from ten to twelve bushels of wheat, and fifteen to thirty-five bushels of corn per acre. The yield of the rich sandy loams along Big creek, the Wolf, Hatchie and Mississippi rivers is of a character satisfactory to the most parsimonious. Hatchie and Wolf rivers enter the Mississippi on the northern confines of Memphis. Farms along these streams, and especially those north of Wolf river and along its tributary, Big creek, in the northern and north-western districts of the county, are wonderfully productive, often yielding a bale of cotton per acre. There is no better country for grapes, peaches, summer apples, blackberries, raspberrries and strawberries. There are several vineyards and fruit farms in the county. The various grasses, including clover, do well upon bottom lands. Vegetables are largely raised. Dairy farming in the neighborhood of Memphis is very profitable.

The railroads are the Memphis and Charleston, the Memphis and Louisville, the Mississippi and Tennessee, all old roads, and several others in process of construction, and others as yet existing only on paper. The "Great Father of Waters," which bounds the county on the west, forms the main channel of commerce.

Memphis is the metropolitan city of the State, and has a population of 65,000 inhabitants. An idea of the extent and volume of business in Memphis may be gleaned from the following statement of annual sales:

Cotton, 440,000 bales worth	$32,000,000
Groceries, liquors and western produce	12,500,000
Dry goods, clothing, boots and shoes, and miscellaneous merchandise	15,000,000
Home manufactured articles	3,500,000
Total	$63,000,000

The public schools are excellent and attended by over 2,500 pupils. The growth of Memphis has been marvelous. In 1850 the population was 6,427, and taxable values $4,600,000; in 1860, population 22,643, and taxable property $21,500,000; in 1870, population 40,371 (not including from 8,000 to 10,000 absentees at the time of taking the census,) and taxable wealth $24,783,190, while to-day, the population in the city and immediate environs is at least 65,000, and the taxable wealth $29,801,592.

TIPTON COUNTY.

ORGANIZED 1823. *County-seat, Covington*—Tipton belongs to that belt of counties bordering on the Mississippi river so remarkable for the exuberant fertility of soil, and forests of magnificent trees. It has an area of about 440 square miles, about 70 of which are in the Mississippi Bottoms. The number of acres, exclusive of town lots, assessed for taxation is 270,704, valued at $2,763,155, or about $10.20 per acre. The total value of taxable property for 1873 was $3,354,682. Population in 1870—14,884, of which 6,891 were colored. This county lies mainly on the Plateau or Slope of West Tennessee. The extreme western, much the smaller portion is in the low alluvial plain or bottom of the Mississippi river. The plateau portion is from 130 to 200 feet above the other, and terminates in a bold escarpment, facing the bottom of the Mississippi. It is watered by Hatchie river and tributaries. The prevailing color of the soil in this county is dark, but not black, and the prevailing color of the sub-soil is

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yellowish. In the north-eastern and western districts, however, there is found a different soil and sub-soil, the former being of a reddish or brown tinge, while the sub-soil is a rich red clay. Along the water-courses east of the bluff, the dark soil predominates, and west of the bluff, in the bottoms, it is almost black. The reddish or brown lands are regarded as the best for cotton, while the darker lands are thought to be the best for corn. The soil, timber, crops and price of land are almost the same as in Lauderdale. Fruits grow well. Almost every farm-house has an orchard. The varieties of fruit most prized, are the peach, apple, plum and cherry. Berries grow in every section of the county.

WEAKLEY COUNTY.

ORGANIZED 1821. *County-seat, Dresden*—This is one of the northern counties of West Tennessee, and contains about 550 square miles. Acres assessed for taxation in 1873—337,387, valued at $3,653,464, or $10.80 per acre. The whole value of taxable property, $4,100,065. Population in 1870—20,755; colored, 3,899. A fraction has been taken from the county since that time. Weakley is a good representative or type of the great sloping Plateau of West Tennessee. Its general surface is level with a gentle inclination to the west. There are, however, some sections which are more or less rough and hilly. Immediately around Dresden the country is considerably broken, and in the north-eastern part of the county the surface is hilly. The western portion of the county contains much more good land than the eastern. West of Dresden the lands are generally rich. In some parts the principal growth is black oak, interspersed with white oak, post oak, hickory, black gum and dogwood, with but few poplars; in other parts there are large quantities of poplar, white oak, beech and sweet gum, (well adapted for cutting into lumber,) together with hickory, post oak, black gum and dogwood. The lands presenting the last growth are generally level, and well adapted to the raising of corn, tobacco and wheat. The barren land east of Dresden is well adapted to the growing of corn, wheat, cotton, and the very finest quality of tobacco. This, however, does not grow so large as on the poplar lands in the western part of of the county. Best improved lands sell for twenty-five to thirty dollars per acre; medium do, twelve to fifteen dollars; inferior do, five to twelve dollars. Corn, tobacco, wheat, cotton, oats, rye, peanuts, sweet and Irish potatoes, as well as the various grasses are grown in the county. The Nashville and Northwestern Railroad passes through the county diagonally from south-east to north-west. The Mississippi Central Railroad passes through it, running on a line a little west of the center, crossing the Nashville and Northwestern Railroad at Martin's depot, between Gardner's Station and Raulston's. The Memphis and Louisville Railroad just touches the extreme south-east corner of the county, crossing the first named at McKenzie, in Carroll county. Dresden has a population of 500.

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MINERALS OF TENNESSEE.

COAL.

Under the stimulating effect of a brilliant sun, a humid climate and an atmosphere charged with carbonic acid, myriads of ages before man appeared, vast forests, gorgeous in their beauty and dense in their foilage, sprung up in widely extended swamps, flourished for a time, decayed and made thick mats of slimy organic matter. Earthquakes with tumultuous throes upheaved mountains and produced depressions. These depressions were swept over by the huge waves of a stormy ocean, depositing their burdens of sand, gravel, and clayey matter upon the vegetable mass. Oscillations afterwards elevated this sand and clay-covered deposit, and vegetable life appeared, to be at some remote period again submerged. These processes continued through ages, the deposits of earthy matter weighing down and shutting out from the influence of the atmosphere and the light of day the remains of plant-life, in which condition they were transmuted into coal. Such is the theory of geologists in regard to the formation of bituminous coal, and doubtless a true one, as the same process in all of its stages may be found going on at the present day. Anthracite coal is the bituminous coal cooked under pressure and subterranean heat.

By far the most important coal field in America is the Appalachian, extending in a north-east and south-west direction a distance of 875 miles through the western part of Pennsylvania, the eastern part of Ohio, the western corner of Maryland, nearly all of West Virginia, and the eastern part of Kentucky. It crosses Tennessee, and ends near Tuscaloosa, in Alabama. It covers an area of 80,000 square miles, 60,000 being available. This is about ten times the area of the productive coal fields of Great Britian. The area of this coal-field, in Tennessee, is 5,100 square miles, and includes within its limits the counties of Scott, Morgan and Cumberland, the greater parts of Fentress, Van Buren, Bledsoe, Grundy, Sequatchie and Marion, considerable parts of Claiborne, Campbell, Anderson, Rhea, Roane, Overton, Hamilton, Putnam, White and Franklin, and small portions of Warren and Coffee—twenty-one in all. It is co-extensive with the Cum-

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berland Table-land, the third natural division of the State, and forms an irregular quadrilateral 71 miles wide at the northern end, and 50 at the southern.

This Cumberland Table-land has generally a broad flat top, capped with a layer of conglomerate sandstone, averaging perhaps seventy feet in thickness. This layer of sandstone on the edges of the Table-land forms a steep escarpment or brow, bold, distinct, and well marked from 20 to 100, and sometimes 200 feet high. Beneath this often overhanging brow the steep, woody slopes of the sides begin and run down to the low lands. These slopes below the cliffs usually rest against the lower Coal Measures and upon the Mountain Limestone. The eastern outline of this Cumberland Table-land, as may be seen by the accompaning Map, is a nearly direct line, bulging out in a graceful curve, and taking in portions of Roane, Anderson and Campbell counties. The western edge is jagged, notched by innumerable coves and valleys, and presenting a scalloped or ragged contour, with outlying knobs separated from the main Table-land by deep ravines or fissures. In the southern portion, near the eastern side, is a deep gorge, canoe-shaped, with steep escarpments rising 800 to 1,000 feet above the valley, through which the Sequatchie river flows. This is the Sequatchie Valley, which separates the lower end of the Table-land into two distinct arms. Through the eastern arm the Tennessee River breaks, and after flowing down the Valley, which is an extension of the Sequatchie Valley, for a distance of sixty miles, turns at Guntersville, Alabama, and soon afterwards cuts through the western arm fifty miles from the Tennessee line. This Sequatchie Trough is 160 miles in length, the Tennessee end being sixty miles, and the Alabama end one hundred.

The eastern arm of the coal-field, on the western side of which this remarkable valley passes, is six or eight miles wide. Between the Tennessee river and the Nashville and Chattanooga Railroad, it is called Raccoon Mountain. Separated from this by Wills' Valley, rises up in massive proportions, Lookout Mountain. The latter is an outlier of the Cumberland Table-land, and geologically is closely allied to it.

Passing now to the north-east corner of the coal region, we find a quadrilateral block dissevered from the mountain mass by the valleys of Elk Fork and Cove creek, the former running north-east and emptying into the Cumberland river, the latter running south-east into the Clinch river. Through this pass the route for the Cincinnati Southern railroad has been surveyed.

The average height of the Cumberland Table-land is two thousand feet above tide-water, but some of the ridges of the north-eastern part rise to a much greater height, reaching at places, as at Cross Mountain, 3,370 feet, and at Coal creek, 3,500 feet. The Valley of Cove creek is 2,300 feet lower than the high points of Cross Mountain. The part of the Valley of East Tennessee contiguous to the mountain is about 1,000 feet above the sea, so that, viewed from that Valley, the Cumberland Table-land stands out with singular boldness and sharpness of

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outline. Everywhere in the northern part it is marked by a succession of cliffs, elevated one above the other, with intervening wooded slopes. On the eastern side, parallel with the main mountain mass, and separated from it by a narrow vale, is a steep, roof-like sandstone ridge, with the layers upturned on their edges, and resembling a huge military work protecting the main mountain from incursions from the Valley of East Tennessee, the only access being through a few gaps like that of Coal creek. This ridge is known as Walden's Ridge. Following this ridge southward, the name is applied to the whole arm between Sequatchie Valley and the Valley of East Tennessee.

We have said that this coal region is sheeted with a thick conglomerate sandstone, but upon this sheet, a short distance from the edges of the precipices, other strata are superimposed, rising in some places, 1,000 feet above the conglomerate or general surface, and forming, as it were, mountains upon the top of the Table-land. Cross Mountain is one of these.

In the northern part of the coal region its plateau character is destroyed by these superincumbent mountains. For many miles Cross Mountain, especially in the counties of Anderson and Campbell, forms the eastern escarpment of the main coal region, though Walden's Ridge, which runs parallel with it, contains some coal, but in it the coal always dips at a high angle.

But without going further into details as to the topographical features of this coal-bearing area, we return to its general features, in order that the reader may have a clear conception of it. First swelling up from the lowlands and forming the base of this plateau, is the massive Mountain Limestone, from 400 feet at the northern end to 720 at the southern extremity in thickness, extending one-third, and sometimes two-thirds of the way up to the general top. Then come strata of shale, sandstane, interstratified with seams of coal, the whole capped by the thick conglomerate before mentioned. These strata between the Mountain Limestone and the overcapping conglomerate sandstone, are called the Lower Coal Measures. The mountains and ridges made up of strata of coal, shale, fire-clay, sandstone and clay iron-stones that are superimposed upon the conglomerate, are called the Upper Coal Measures. Coal Measure may be defined to be a group of strata, in which the coal is interstratified. The coal often appears in beds so thin as not to be workable. These beds, sometimes, however, swell out locally to great thicknesses.

Recurring again to the building up or formation of this coal plateau, at the risk of being tedious to the reader familiar with it, we shall endeavor to give a clearer idea by an illustration. Suppose a long, narrow table to be placed on the ground, sitting longitudinally north-east and south-west. Build up under this table a stone foundation with a sloping surface, lower at the northern end, but reaching half way to the top of the table at the southern extremity. Upon this foundation pile up sheets of plank until they touch its under surface. The stone foundation will represent the Mountain Limestone, the sheets of plank

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the Lower Coal Measures, and the top of the table the thick conglomerate cover.

Thin blocks piled on the table top, a short distance from the edge, at some places higher, at some lower, being greatly higher near the north-east corner, will represent the Upper Coal Measures. Now, if a little to the east of the longitudinal middle line a wide gash were cut down to the ground through piles of blocks, the table top, sheets of plank, and masonry, from its middle, southward, dividing the southern part of this mass into two parallel but unequal arms, this gash would represent the Sequatchie Valley, the eastern arm taking the name of Walden's Ridge. A similar gash in the north-east corner, running north-east, would represent Elk Fork Valley. From the head of this valley, if another were cut running south-east, it would represent Cove Creek Valley, both together cutting off the quadrilateral block referred to.

It may here be stated that wherever the highest ridges and mountains upon the general surface of the Cumberland Table Land are found, the conglomerate has been depressed, and sinks to a lower level than where there is no superincumbent weight.

The reader is now able to appreciate the following section entirely through both Coal Measures. The section was traced out near the Sewanee Mines, in Grundy county, by Dr. Safford, and is found in his Geological Report. It is the most complete section of both Coal Measures yet found in this part of the coal-field, though the Upper Coal Measures in the north-eastern portion of the coal regions have more beds, sometimes reaching as high as twenty-one. At other places, some of the strata thin out and disappear. Beginning at the top and descending, as though in a well or shaft, we have Sewanee Section.

Upper Measures; 290 feet.	(13) Conglomerate; cap rock of the upper plateau, and the uppermost stratum in the region	50 feet.
	(12) **Coal,** a few inches, (G)	
	(11) *Shale*	23 feet.
	(10) **Coal,** outcrop, (F)	½ foot.
	(9) *Dark Clayey Shale*	1 foot.
	(8) *Sandy Shale*	25 feet.
	(7) Sandstone	86 feet.
	(6) *Shale,* more or less sandy	45 feet.
	(5) **Coal,** *Main Sewanee,* from (E)	3 to 7 ft.
	(4) *Shale,* some of it sandy	45 feet.
	(3) **Coal,** outcrop, (D)	1 foot.
	(2) *Shale*	3 feet.
	(1) *Sandstone*	17 feet.

We here reach the bottom of the upper Coal Measures, and come to the thick conglomerate that caps the whole coal region. Descending, we pass successively through

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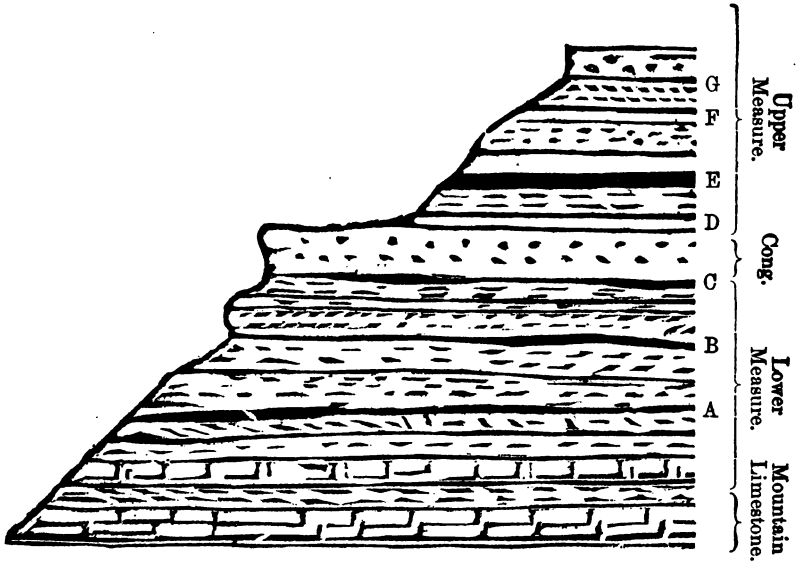
	CONGLOMERATE	70 feet.
Lower Measures; Gizzard Portion) 228 feet.	(10) **Coal**, outcrop, from (C)	½ to 1 ft.
	(9) *Shale*, with clay at top	10 feet.
	(8) Sandstone, *Cliff Rock*, (*Lower Cong.* of Ætna Mines)	65 feet.
	(7) **Coal**, outcrop, from (B)	½ to 1½ ft.
	(6) *Shale*, with a few inches of indurated clay at top	8 feet.
	(5) *Sandy Shale*	22 feet.
	(4) Sandstone, hard	78 feet.
	(3) **Coal**, has occasionally shale above and below it; the Coal from (A)	1 to 3 ft.
	(2) *Hard Sandstone*, local	20 feet.
	(1) *Shale*, including a thin sandstone	20 feet.

MOUNTAIN LIMESTONE.

The last or the Mountain Limestone forms the pedestal, as it were, upon which the Coal Measures rest.

Including the Upper and Lower Coal Measures, there are seven strata of coal, aggregating a thickness of from seven to fourteen and a half feet. Many of these beds, however, are too thin to work, and are given merely to show the extent of the Coal Measures.



The above cut is a representation of the entire Coal Measures as exhibited at this region. It will be observed that the main conglomerate, which has been spoken of as forming a sheet over the whole Cumberland Table-land, divides the Upper from the Lower Coal Measures; and furthermore that the seams below the conglomerate are lenticular in character, while those above are more uniform in thickness. If additional strata were piled upon the portion above the conglomerate, including not far from a dozen beds and seams of coal, it would be a fair representation of the Upper Measures as found at Coal

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Creek, in Anderson. The second coal (bed E) above the conglomerate is the Main Sewanee, the only one which has been worked so far at this point. The second below (bed B) corresponds, it is thought, to the Main Ætna. The escarpment or slope represented in the engraving is typical of the slope on the western side of the Table-land, in which appear successively the wooded slope, the vertical or overhanging conglomerate, which forms such conspicuous cliffs, the back bench and the Upper Measure. The level portion above the main conglomerate may be considered as the general surface of the Table-land; but, as will be seen from the engraving, there lies, at a greater or less distance from the edge, superimposed strata that make considerable hills, which often present themselves as a well defined terrace. It may be added for clearness, though involving some repetition, that the main conglomerate in the north-eastern part of the Table-land sinks to a lower level while the strata are so multiplied as to make mountains. In the Sewanee section, the conglomerate is about 800 feet above the low lands at the base of the Table-land, while at Coal Creek, and at other points to the north-east, it comes down to the level of the valleys.

SEWANEE MINES. The outcrop of the coal at these mines is 1,922 feet above the sea. The tops of the highest rocks in the vicinity reach an elevation of 2,161 feet. This property consists of 25,000 acres of land, nearly every foot of which is underlaid with coal. The seam worked at present extends over 8,000 acres. A railway 21 miles long belongs to the property, and connects Tracy City with Cowan, a village on the Nashville & Chattanooga Railroad, 87 miles south of Nashville.

The main Sewanee seam will average about 4½ feet. Its largest development is 10 feet 4 inches, and least 2 feet. Wherever the coal is thickest the superincumbent mountains are low, and the laminæ of the coal are more disturbed. Under the heaviest weight the coal is often very thin. When the weight above is constant, the seam is very regular and unvarying in its thickness. The seam has a general dip to the north-east of about eight feet to the mile.

There are 405 persons employed at these mines, (May, 1876), 210 of whom are convicts. A population of 1,800 is supported by the mining operations at this place, and here is found the best market for farm products on the Cumberland mountains. The average day's work for the coal miner is eighty-two bushels of coal. The screenings are made into coke, there being about 4,000 bushels made daily. The company at present has 120 ovens, and the coke is shipped to Alabama, Chattanooga, and other points, and is used in the manufacture of iron, for which purpose it is said to be very superior, owing to its freedom from sulphur and other impurities. The coal is rather singular in its structure, being soft and shelly, with contorted laminæ and a polished shining surface. It is very pure, showing about 65 per cent. of carbon and only about 6 per cent. of ash. As a coking coal it is equal to any in the State. It is now used for the manufacture of gas at the Insane Asylum, near Nashville, and for more than a year was used at the gas

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works in Nashville. The manager, in a statement made to the company, says that by the addition of resin it is equal to the best Pittsburg coal for making gas. For manufacturing purposes and for grates it is highly esteemed. It is very dry and its specific gravity is below the average. The waste in digging is considerable, but this is used in the manufacture of coke.

Coal (the run of the mines) is delivered at the following prices:

To Cowan	per bus.	6½ to	7c.
" Chattanooga	"	9 to	10c.
" Nashville	"	10 to	11c.

Coke is delivered at the following rates:

To Cowan	per bus.	5 to	6c.
" Chattanooga	"		7c.
" Rising Fawn Furnace, Ala	"		9½c.
" Bartow Furnace, near Atlanta, Ga	"		10c.

The subjoined table shows the amount of coal which has been raised and shipped from these mines since they were first opened in June, 1866:

SHIPMENTS FROM SEWANEE MINES.

Months.	1866	1867	1868	1869	1870	1871	1872	1873	1874	1875	1876
	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars
January	.....	340	437	408	502	452	866	1204	781	941	1144
February	.....	268	358	388	367	501	936	1107	719	1,000	1181
March	.....	219	434	408	538	362	850	927	646	602	1270
April	.....	268	266	243	364	327	795	822	653	913	1022
May	.....	236	255	119	237	346	646	788	617	580	1120
June	68	239	231	110	245	346	495	531	587	557	.....
July	42	201	230	136	225	297	781	564	622	631	.....
August	115	208	254	191	179	457	893	857	778	913	.....
September	123	406	347	293	302	656	877	1008	849	1,011	.....
October	162	369	261	428	546	780	1,054	930	1014	1,287	.....
November	189	453	557	462	642	870	1,055	834	1129	1,280	.....
December	225	368	428	502	564	800	1,004	546	942	1,195	.....
Totals	924	3625	4085	3688	4711	6194	10,252	9938	9337	10,910	.....

The grand total for ten years is 69,401 cars, or 694,010 tons. Less than 200 acres have been mined. This seam on the company's lands will supply 27,000,000 tons yet before exhaustion, and this without tapping any of the seams of the Lower Measures.

The value of the coal as a coking coal, as well as for making steam, being now settled, and the quantity of coal being practically inexhaustible, and the railroad of this company being the key to more than 50,000 acres of coal—all of superior quality—far surpassing all the other coal fields of Tennessee, the future growth of this company, and the immense value of the enterprise to the prosperity of Tennessee, are assured facts. By lateral or branch roads, and by opening other mines, the business of the company may be made to the South what the Reading Railroad is to Pennsylvania. The company has five locomotives

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and about 149 cars. At the mines a town containing a population of 1200 has been built up.

South of the Sewanee Mines, near the Anderson depot, on the Nashville and Chattanooga Railroad, is a section which has four coal seams, and so of a section taken at a point a mile east of the lower end of Battle Creek, and at the Ætna Mines. In the northern part of Grundy and in Warren county, the veins are reduced to two, and the whole volume of the Measures reduced from 360 feet to fifty.

The beds of the Lower Coal Measures are quite variable, irregular and of often deceptive. They sometimes swell out into lentiform masses are five, six, seven, and even greater thickness, and then diminish to a mere thin plate. The quality of the coal is not highly bituminous, generally, but compact, solid, and burns freely. The quantity of coal in the Lower Coal Measures is quite large, and there are some heavy local developments of this coal in the valley of the Little Sequatchie Creek, which rises near Tracy City, runs south, and empties into the Sequatchie river a short distance above Jasper. In one place the coal is five feet in thickness, and in another locality it shows itself beneath the cliff nine feet thick, exposing a horizontial layer for the distance of forty feet. In the valley of Crow creek, near Anderson depot, on the Nashville and Chattanooga Railroad, a bed in the Lower Coal Measures 160 feet below the conglomerate, from two to five feet in thickness, has been worked, but operations, except for local demand, have been discontinued at that point. The quality of this coal is said to be excellent, being lustrous and laminated by thin seams of mineral charcoal. Some pyrites, in seams, occur in this bed. This stratum thickens further south, and in one place in Alabama it was found to measure seven feet, soon, however, thinning down to two.

At the head of Little Crow a bed two feet in thickness supplies an excellent quality of coal. The valley of Battle creek supplies a large amount of coal from the Lower Coal Measures. The shipments by the Chattanooga Railroad from Bridgeport, the point to which all the coal from that region is sent by the Jasper Branch, amounted for the year ending June 30, 1873, to 279,480 bushels, of which 270,241 bushels were from the Battle Creek Mines.

The Ætna Mines. These mines are in Marion county, thirteen miles from Chattanooga, near the Nashville and Chattanooga Railroad, and between it and the Tennessee River, in what is called Raccoon Mountain. They were first opened in 1854, and are now worked by J. C. Haselton, who employs from 100 to 150 hands. The Upper Measures contain the Walker seam, four feet in thickness; the Slate Vein, five to six feet, with eighteen inches of slate and coal mixed, and the Kelly coal, two or three feet—the Kelly coal being the lowest. These beds are all above the upper conglomerate, which is here simply a sandstone seventy-five feet in thickness. Between this conglomerate and the lower conglomerate, which is the same that caps the coal region, are two thin seams of coal, unimportant. Below the last named conglomerate are four beds of coal. First in order of descent

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is the Main Ætna or Cliff, which in its outcrop around the mountain, made a fine presentation and averaged probably three feet in thickness. It proved, however, deceptive and as the drifts advanced from the outcrops inwards, the seam diminished to a feather edge and soon became too thin to work, as though the superincumbent weight of the mountain mass had forced the bed of coal when in a plastic state, from the center outwards, so that a vertical section of the stratum would be cuneiform or wedge shaped. The coal has all been worked out and the seam abandoned. Twenty feet below this, the intervening strata being composed of shale, is a bed of coal from one-half to a foot in thickness.

Two more beds lie below this, from both of which coal has been taken. In the lowest a bank was opened, which at first was six feet in thickness, increased to nine, and then fell off to three, showing the lenticular characteristics of the seams of the Lower Measures. This locality is interesting as showing nine distinct beds, five of which are of workable thickness. From this point a very large amount of coal has been taken from the Lower Measures, peculiar in its structure. The laminæ of this coal are separated by seams of charcoal resembling that made of poplar wood, fuzzy or soft and spongy. The coal is of good quality and comparatively free from pyrites. The shipments from these mines have been as high as 367 cars per month, or 91,750 bushels, but now amount to 250 cars per month, or 62,500 bushels. About one-half of the coal is made into coke, which commends itself to foundrymen and furnacemen, on account of its superior quality, containing as it does ninety per cent. of fixed carbon and only about three-fourths of one per cent. of sulphur. This coal is highly prized by blacksmiths and a demand for it comes from points as far distant as New Orleans and St. Louis.

The section at this place, as taken by Dr. Safford, is as follows:

Upper Measures, 220 ft.	(8)	Sandstone, cap-rock of plateau above the Ætna Mines	75 feet
	(7)	*Shale*	48 "
	(6)	**Coal,** "*Walker Coal;*" uniform, good, cubic	4 "
	(5)	*Shale,* including sometimes a thin *coal,* (Cravens) from	30 to 40 "
	(4)	**Coal,** "*Slate Vein;*" including a layer eighteen inches thick, of shale and coal mixed	5 to 6 "
	(3)	*Shale*	44 "
	(2)	**Coal,** "*Kelly Coal,*" good, cubical coal, from	2 to 3 "
	(1)	*Fire-clay,* from	1 to 2 "
		UPPER CONGLOMERATE, simply a sandstone here	75 "
	(4)	**Coal,** seam, a few inches.	
	(3)	*Shale*	30 to 40 "
	(2)	**Coal,** seam, ten inches.	
	(1)	*Sandy Shale,* from	100 to 130 "

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	LOWER CONGLOMERATE, *Cliff Rock* of the sections east of Sequatchie valley	70 to 100 "
LOWER MEASURES, (not including *Lower Cong.*,) average, 288 feet.	(14) *Shale,* sometimes wanting, the rock above making the roof, the coal from	0 to 12 "
	(13) **Coal,** Main Ætna, or *Cliff Vein;* will average, near the outcrop, perhaps	3 "
	(12) *Fire-clay,* indurated, contains *Stigmaria,* often with rootlets attached; has been made into good fire-brick	1 to 3 "
	(11) *Shale*	5 to 20 "
	(10) **Coal,** thin	½ to 1 "
	(9) SANDSTONE and *Sandy Shale*	80 to 120 "
	(8) *Shale*	0 to 5 "
	(7) **Coal,** of good quality, usually too thin to be mined, from	½ to 2 "
	(6) *Fire-clay*	0 to 3 "
	(5) *Sandy Shale* or *Sandstone*	20 to 25 "
	(4) *Shale*	15 to 20 "
	(3) **Coal,** lowest bed like the last, and banks have been opened in both	½ to 3 "
	(2) *Fire-clay*	0 to 3 "
	(1) *Shales and Shaly Sandstones*	80 to 150 "

MOUNTAIN LIMESTONE FORMATION.
Variegated Shales and Limestones in the Valley of Running Water.

In the deep gorge made by the Tennessee river, where it cuts its way through Walden's Ridge, the same presentation of coal beds appears. The one corresponding, it is thought to the Main Ætna has been worked to some extent, and the coal shipped by the Tennessee river.

THE VULCAN MINES. These mines are in Marion county, sixteen miles from Chattanooga, and near the railroad leading from the latter point to Nashville. They were first opened in 1868. They are worked by Badge & Eaton, who employ about sixty-five hands. The product of these mines for the year 1873, was 365,000 bushels, (eighty pounds to the bushel,) the market for which is Chattanooga and points south. Considerable quantities have also been sold to the Nashville and Chattanooga Railroad for use on locomotives.

The seam worked at present is two and a half feet in thickness. There are three other seams in the mountain that are known, the heaviest of which is about three and a half feet thick. The other two average about ten inches each, though a careful examination would doubtless show their lentiform character.

SHOAL MINES. These were opened in September, 1873. They lie six miles north-east from Chattanooga. There are four seams in view; the upper one, four and a half feet thick, is the one worked. When first opened, the coal from this bed was soft and friable, but became harder as the entry advanced. The outcrop of the seam is only eighteen inches in thickness. It swelled out to five and a half feet, and then went to four and a half feet. It has remained regular since reaching that thickness. The dip of the bed is about five degrees outwards, just enough to secure good drainage. The mines are not worked at present, owing to the want of transportation. The lowest bed at this point was worked by the government during the war.

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SODDY CREEK MINES. These are in Hamilton county, on Soddy Creek, twenty miles above Chattanooga, and four miles from the Tennessee river. A tram-road leads down to Soddy creek, where the coal is dumped into barges and shipped by the creek to the river, thence to Chattanooga and other points south.

This coal is regularly stratified, bituminous, and burns freely. At present, about twenty-five hands are kept employed, and 150,000 bushels per month are exported. The mines were not regularly worked until 1866, when a company of energetic Welchmen leased them for fifty years, paying a royalty of one cent per bushel. A lump of this coal weighing 3,600 pounds is exhibited on the streets in Chatanooga. The upper surface for four inches is spumous and shelly, the remainder of the block is a stratified hard coal, but not cubical. The seam is from two and a half to three and a half feet thick.

SALE CREEK MINES. Nine miles north-east of Soddy, on Rocky creek, three miles from Tennessee river, in an outlying ridge, are the Sale Creek Mines. The coal from these mines is said to be superior for all purposes. It has fine welding properties, and is therefore much sought after by blacksmiths. These mines were worked as far back as 1843; but little coal except for blacksmithing, was consumed in this State at that time. In 1866, Major Thomas A. Brown and Col. John Baxter, of Knoxville, began to mine the coal for shipment. At present, they are worked by Welchmen, who have leased them, as well as the Soddy Mines, from Clift, McRea & Pearl. Thirty miners are employed, all of whom are interested and lessees. The monthly product is 50,000 bushels. A tram-road conveys the coal to the river, where it is shipped in barges to points below. Much of it is consumed in the iron works at Chattanooga. The structure of this coal is peculiar. No stratification is observable, but it has the appearance of having been boiled, and resembles hardened blocks of boiled pitch. The thickness of this bed is about four feet.

The Morgan Mines and the mines at Piney are only used for local purposes, and contribute but little to the coal product of the State. The seams are from two to five feet in thickness. At White's creek, there is a bed five and a half feet thick, which is used for local purposes. At Clear creek there is a fine development of coal. This property has recently been purchased by Stambaugh, of Youngston, Ohio, who contemplates the erection of a furnace at this point. Two coal beds have been tested, one showing from five to seven feet in thickness, and the other from two to three feet.

At Richland creek, below Sale Creek Mines, is a stratum of coal about three feet thick, and another higher up the mountain from four to five feet thick. This property has been recently bought by English capitalists. From this point southward, the coal lies in beds nearly horizontal. North of this, the strata are greatly disturbed, the coal beds forming "horsebacks," and often assuming positions nearly vertical, lying sometimes in great masses, and again thinning out to a mere wafer.

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ROCKWOOD MINES. Continuing north-easterly from Sale Creek Mines, we reach the mines of the Roane Iron Company, situated in Roane county, ninety-two miles, by land, above Chattanooga, and one hundred and twenty miles by water. This remarkable body of coal was discovered in 1840, by William Green, an employee of John. Brown, father of Major Brown, of Chattanooga. Green and William Brown entered the land shortly after its discovery. The coal was soon thereafter opened for local purposes, and used by blacksmiths until the property was purchased by Wilder & Chamberlain, 1867. These gentlemen subsequently induced capitalists to enter into business with them, and they have incraased their capital from $100,000 to $1,000,000. Two blast furnaces are built at this point, with capacities respectively of twenty-five and thirty tons per day. The iron ore lies in a continous bed, nearly vertical, about four feet in thickness, and is supposed to be a stratum of a synclinal trough which disappears under the Cumberland Table-land, reappearing in the Sequatchie Valley and in Elk Fork Valley. The dip of the iron bed is about eighty degrees, and inclined towards the mountain mass. This dyestone bed, extends from Alabama to Pennsylvania, running a distance through Tennessee of 160 miles. Upon the top of many hills it is folded back by lateral pressure so as to resemble a flattened S. A quarter of a mile from this iron bed, are seen the outcroppings of the coal. The dip of the main Rockwood seam is thirty-five degrees toward the northwest. This seam is remarkable for the immense curled masses of coal rolled up between the plications or "horsebacks," and attaining a thickness of from sixty to one hundred and ten feet. By reason of these plications, the dip of the stratum is sometimes locally reversed. Three principal entries have been driven in at this place, designated respectively Banks 1, 2 and 3.

In Bank No. 1, the main entry is 1,200 yards long, with 1,600 yards of cross entries, and more than a mile of rooms.

Bank No. 2 has a main entry 1,000 feet long, with 575 yards of cross entries, and 1,200 yards of rooms.

Bank No. 3 has an entry 500 yards long, but no cross entries.

The outcrop of coal above No. 1, is 250 feet; above No. 2, 500 feet; above No. 3, 75 to 100 feet.

North-west of the furnace, at a distance of 1,200 yards, in the bottom of a small stream that runs down the ravine towards the furnace, is a remarkable outcrop of coal, over which the water flows for one hundred yards. It is on this mountain stream that a local thickness of 110 feet of coal is found. After these thick accumulations, the stratum thins out to a mere wafer. The coal has a crushed aprearance, and though well suited for the purposes for which it is employed, will not bear transportation well. An analysis of this coal, as well as of several others, will be found further on in this article.

The number of hands employed at the coal mines at Rockwood is eighty, of which number fifty-four are miners. The daily product is 4.000 bushels, which is brought down by a tram-road to the furnace

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and conveyed by a chute into the stock-room. The fine coal is made into coke. Forty coke ovens, besides numerous coke pits, are kept constantly in operation.

The proportions of charges are:

Coal	1,600 pounds.
Coke	1,200 pounds.
Ore	2,200 pounds.
Limestone	600 pounds.

Seventy-seven of these charges are put in the hot blast furnace, Rockwood No. 2, in twenty-four hours. There are no shipments of coal from Rockwood, the whole amount being consumed by the furnaces at that point, and by the various machine shops. There are other seams above and below the one worked at Rockwood, and the supply is practically inexhaustible. All have the same dip, but disturbed by local flexures.

HOOPER MINES. These are on the Little Emory, four miles from the Tennessee river, and have been worked, for local purposes, for twenty-five years. The bed is four feet thick, and the coal is of a very superior quality.

WILCOX MINING COMPANY. The property of this company is situated along the north-east line of Roane county, occupying the south-eastern slope of Walden's Ridge. It touches the Big Emory river, in which there is always water enough to float barges and small steamers, into which the coal is dumped from the cars. The property includes ten acres upon one of the spurs of Cumberland Mountain behind Walden's Ridge. In 1866, William and Edward Small, of Baltimore, bought 1,200 acres of land, and subsequently added other tracts. These gentlemen worked the property until 1869, when it passed into the hands of Col. John Baxter. Wilcox Brothers bought the property in 1870, and it was transferred to the Wilcox Mining Company in August of the same year. At the time this company took possession, the facilities for transferring the coal to the river were very poor, but a narrow gauge road has been built with easy grades. The coal is lowered from the mine to the track by an incline 1,000 feet long.

The following is a general section of the strata in that region, as made by Prof. Bradley, beginning with the highest beds exposed, and numbering downwards, while the coal seams are numbered from below upwards:

1.	Shaly and shaly sandstone, mostly covered	130 ft.
2.	Dark clay shales	8 to 10 "
3.	Hard dark micaceous shale	1 "
4.	COAL *No.* 12	1½ "
5.	Hard black sandy shale	1 "
6.	Covered space, sandy shale at 90 feet	136 "
7.	Thick-bedded and shaly sandstones	16 "
8.	Thick, irregular-bedded hard sandstone	21 "
9.	Soft clay shale	5 "
10.	COAL *No.* 11	1 to 2 "
11.	Soft fire-clay	1 to 2 "

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12.	Sady shales and thick-bedded sandstones	35 ft.
13.	Clay shales, partly sandy	50 to 60 "
14.	Hard sandstone	1 to 3 "
15.	Coal *No.* 10	1 to 3 "
16.	Hard fire-clay and soft shales	6 to 8 "
17.	Thin and thick-bedded sandstones	20 to 30 "
18.	Covered, mostly shales	50 to 60 "
19.	Irregular thin-bedded sandstone	16 "
20.	Clay shales, partly black	5 to 10 "
21.	Coal *No.* 9	1? "
22.	Covered, mostly sandy shales	50 "
23.	Coal *No.* 8	"1 ½" "
24.	Thick-bedded sandstones	18 "
25.	Covered, mostly shales	45 "
26.	Heavy-bedded sandstone	72 "
27.	Covered, mostly shales, partly sandy	58 "
28.	Heavy-bedded sandstone	153 "
29.	Covered, probably shales and shaly sandstones	171 "
30.	Heavy and thin-bedded sandstones	54 "
31.	Ferruginous sandy shales, with beds of iron-stone	90 to 100 "
32.	Irregularly-bedded sandstone	50 to 70 "
33.	Covered, sandy shales and iron-stone, *probably with* Coal *No.* 7	180 to 200 "
34.	Heavy-bedded sandstone	40 to 45 "
35.	Shales	30 to 35 "
36.	Thick-bedded sandstone	1 "
37.	Dark drab, compact clay shales	40 to 45 "
38.	Shaly sandstone	12 to 15 "
39.	Dark drab to black and ferruginous clay shales	25 to 30 "
40.	Coal *No.* 6	3 to 6 "
41,	Dark drab clay shale, with some fire clay	5 to 6 "
42.	Shaly sandstone	10 to 15 "
43.	Heavy-bedded sandstone	47 "
44.	Shales	8 "
45.	Heavy-bedded coarse and fine sandstone	53 "
46.	Sandy shales	8 "
47.	Heavy-bedded light colored ferruginous sandstones, part pebbly	5 "
48.	Soft clay shales	2 "
49.	Heavy-bedded fine grained sandstone	31 "
50.	Ferny shales, some sandy layers	40 "
51.	Coal *No.* 5	3 to 4 "
52.	Hard drab shales	2 to 3 "
53.	Heavy-bedded sandstone, mostly conglomeritic. *Level of* Coal *No.* 4	140 to 150 "
54.	Clay shales, part sandy. *Level of* Coal *No.* 3	180 "
55.	Heavy-bedded sandstone, lower half compact, upper granular	25 "
56.	Gray ferruginous shales, *including* Coal *No.* 2	170 "
57.	Dark drab compact sandstone	40 to 50 "
58.	Thin-bedded sandstone, with shaly partings	45 to 50 "
59.	Shales, *including level of* Coal *No.* 1	150 to 200 "
60.	Bluish-drab fossiliferous limestone	35 to 200 "
61.	Covered, shale or shaly limestone?	125 "
62.	Cherty limestone, with heavy bands of chert	160 "
63.	Green and drab sandy shales	3 to 24 "
64.	Black and drab shale	26 to 117 "
65.	Covered, black shale?	90 "
66.	Red, greenish and yellowish sandy shales, including two band of red hematite and a few thin sandstones	100 to 150 "
67.	Dark reddish and ferruginous shales	say, 500 "
68.	Compact dark blue limestone	" 100 "
69.	Cherty limestone, part fossiliferous	" 200 "
70.	Dark drab limestones, part shaly	" 50 "

"Of the above section," says Prof. Bradley, "Nos. 1 to 59 belong to the Coal Measures, showing a total thickness of nearly 2,700 feet.

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This is a greater thickness than has heretofore been attributed to the entire Coal Measures in this region; while it apparently does not include anywhere near all the formation. There is, however, only a small portion of the section which has not been measured, as well as estimated, and I am satisfied that the total is approximately correct in all its *essential* parts. It has been very carefully measured. Less attention is paid to the lower beds, as the section here is of little importance. Numbers sixty to sixty-two represent the characteristic divisions of sub-carboniferous limestones. Numbers sixty-three to sixty-five represent the "Black Shale" of the West, which is generally accounted the equivalent of the "Genesee Shale" of New York, and called Devonian, though some of its fossils seem more nearly allied to sub-carboniferous than to Devonian species. Number sixty-six is what Prof. Safford, in his recent report on the Geology of Tennessee, calls the "Dyestone Group," and is mostly the equivalent of the "Clinton Group" of New York. The included sandstones at the base may represent the "Medina Sandstone" of New York. Number sixty-seven may also belong to the Medina, though I have preferred to consider it the upper division of the "Cincinnati Group," to which belong numbers sixty-eight and sixty-nine. The latter beds are more compact limestones than are usually found in this group. Number seventy apparently belongs to the Trenton Group, though fossils are, as yet, wanting for proof of the fact.

"All the coal seams, for the vacant numbers, have not yet been found. Below coal number five, which is the first thick seam yet discovered at this place, four seams not observed here, have been found at the Ætna Mines, and it is believed that they all exist on this property. Number one has not been found. Number two was found and opened on the outcrop, and thickened from six to eighteen inches. Number four is the equivalent of the Main Ætna; it lies fifteen feet below the conglomerate number fifty-three. Coal number five has been opened at two points, but not fully tested. This is thought to be the equivalent of the seam marked G in the Sewanee section. Coal number six is over four feet thick; swells, locally, to five and six feet, and has yielded a large amount of superior coal. This is the equivalent of the Rockwood seam, twelve miles south-west, and probably, of the Main Sewanee. Lumps of coal above number six, are the only indications of number seven. This seam is said to contain good bodies of coal at White's creek. Numbers eight and nine have not been distinctly recognized. They are most likely of no practical value. Number ten shows along Laurel branch an average thickness of two feet of superior coal."

The upheaved strata, says the same authority, of Walden's Ridge are, in the main, evidently continuous with the level beds of the valley and mountain back of it. Along a limited space, from the lower part of Laurel branch eastward to beyond D'Armond's Gap, a line of fault runs near the foot of the Ridge, along which the strata are completely broken off and displaced, the highly-inclined beds of appar-

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ently number forty-five of the general section being thrust under and against the edges of the nearly horizontal beds of number nineteen (?), in the Gap. Along Laurel Branch the distubance is evident, but slight.

On the north side of the West Fork of the Little Emory, for half a mile from the Gap, number ten has been worked, at various times, with a reported thicknes of from two to three feet; but the openings have been abandoned. It is a superior coal, as shown by the analysis given below. The area of this portion of the seam is limited by the uplift of Whetstone Mountain beyond it. Still, if the seam were thicker and more regular, its area would be sufficient for profitable mining. As we pass eastward, the valley of East Fork of Little Emory approaches the line of Whetstone Mountain, and makes number ten nearly or quite worthless for a mile or more before reaching the Gap through Whetstone. As the lower and thicker seams must underlie all this territory, it will become valuable when, in the indefinite future, the coal will pay for so deep mining.

As the valley approaches Whetstone Mountain, it retires from Walden's Ridge, and leaves a large area of number ten upon its south side. This is partly in Tarkill Ridge, which reaches from 270 to 470 feet above Little Emory, and partly on the slopes of Walden's Ridge, from which Tarkill Ridge is separated by the Valley of Machine Branch. In both these positions it has been worked, with a thickness of from one to three feet of excellent coal.

The upper seams, numbers eleven and twelve, have been found only in the higher parts of Tarkill Ridge. It is possible that number eleven may exist upon the slopes of Whetstone Mountain; but this is not probable. The heavy-bedded sandstone which forms the crest of Whetstone is apparently one of the beds which lie between number six and number eight.

The coal number six, says Mr. Bradley, is pronounced by Prof. Wormley, of Ohio, to be the best coal he has analyzed. The high percentage of fixed carbon, as indicated by the analysis given below, together with the fact that it softens very little in the fire, shows that it could be worked with great profit in furnaces in its raw state. The percentage of sulphur is also small. The sample analyzed was a full section from roof to floor. This coal yields, in gas retorts, 4.47 cubic feet of gas per pound, as certified by the superintendent of the gas company at Knoxville. The seam, though the equivalent of the Rockwood, and tilted at a higher angle, has been less disturbed, and retains its laminated condition. The amount of slack is inconsiderable. The outcrop of this seam is 636 feet above the dump-house, on the bank of Big Emory. The mine is in the hollow of the mountain, and the general level of the outcrop along this part of the Ridge is from fifty to one hundred feet higher. Prof. Bradley thinks this seam will yield, above the tunnel, 440,000 tons per mile in length of Ridge, and below the tunnel 380,000 before reaching the centre of the Ridge.

The following is an analysis of coal number six, as made by Prof. Theodore C. Wormley, of Columbus, Ohio:

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Specific Gravity	1.308
Water	1.50
Ash—light fawn color	7.70
Volatile matter	27.70
Fixed carbon—coke compact	63.10
	100.00
Sulphur	0.53
" left in coke	0.45
Permanent gas per pound, in cubic feet	3.32

ANALYSIS OF SEAM NUMBER TEN.

Specific gravity	1.285
Water	1.50
Ash—light fawn color	2.60
Volatile matter	30.10
Fixed carbon—coke compact	65.80
	100.00
Sulphur	0.71
" left in coke	0.52
Permanent gas per pound, in cubic feet,	3.32

The product is about 500 bushels per day, and about thirty hands are kept employed.

OAKDALE. The coal at this point is every similar to that found at Rockwood, sixteen miles below, but is not quite so soft, nor does it slack so readily. The bed worked is about four feet thick, swelling out sometimes to five, and then diminishing to two, making what miners call a "squeeze."

It was opened in the spring of 1873, and the coal is only used for making iron. The daily product is 1,000 bushels, and thirty hands are employed in the mines, all Welch. The mines are in Roane county, four miles from Big Emory river, about ten miles from the Tennessee and six from the Clinch. The coal supply is ample.

POPLAR CREEK, OR WINTERS' GAP. Winters' Gap is a complete cut in Walden's Ridge, through which Poplar creek finds its way from the Cumberland Table-land to the Tennessee river. In the Table-land at this place, several seams of coal have been opened; the principal one is seven feet in thickness, was opened in 1852, and for many years the coal was shipped therefrom to Knoxville and Chattanooga, and to Huntsville, Alabama. It was highly esteemed as the best coal brought from Tennessee. It is hard, free-burning coal, bearing transportation well, and when ignited burns like a candle. It is nearly free of sulphur. It was formerly shipped down Poplar creek in barges. Near the gap is a salt well which was bored many years since, and deepened by Prof. Estabrook, who erected works at this point, but died before his plans were perfected. The well was sunk a thousand feet, and the water yielded eight per. cent. of salt. On the eastern face of Walden's Ridge three or more seams of coal are known to exist, and one has been opened, supposed to be the main Rockwood.

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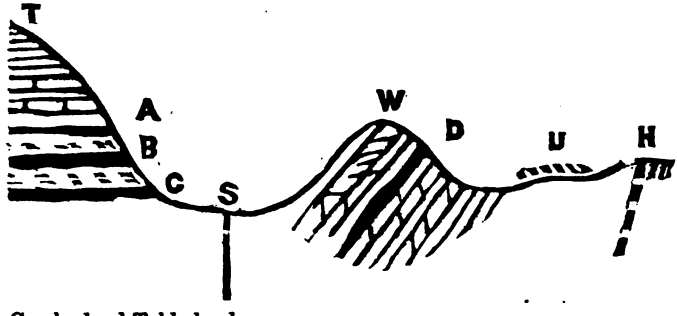
The following diagram will serve to illustrate the topography of this most interesting spot, and will also give the position of the Red Hematie iron ore bed, with reference to Walden's Ridge and the Cumberland Table-land.



T. Cumberland Table-land.
A, B. C. Horizontal beds of Coal.
B swells out sometimes seven feet in thickness.
W. Walden's Ridge.
D. Coal in Walden's Ridge, five feet thick.
S. Salt Well.
U. Mineral Springs.
H. Stratum of Hematite iron ore, greatly inclined.

In the valley, at the foot of Walden's Ridge, are found a large number of mineral springs, consisting of red, black and white sulphur, magnesia, etc. The dyestone bed of iron ore is here almost on a level with the valley, as at Rockwood.

North-east of this point, coal has been mined at Frost's Bottom, on the Mountain Fork of Poplar creek. There is at this place a large surface display of Brown Hematite iron ore. The coal is said to be good and the supply abundant.

It has not been our purpose to enumerate all the points between Chattanooga and Frost's Bottom, where coal has been seen, but only such beds as have been worked. There is not a gorge in the mountain throughout the entire distance in which the outcroppings of coal may not be seen. Along this line at least fifty good coal mines can be opened. The quantity is enough to dispel any apprehensions of a failure of supply for centuries.

Coal Creek Mines. These mines are on Coal Creek, in Anderson county, thirty miles north of the city of Knoxville, on the Knoxville and Ohio railroad. The Coal Creek Mining and Manufacturing Company owns at this point 40,000 acres of land, 25,000 acres of which are coal-bearing. A branch road from the main stem of the Knoxville and Ohio railroad runs through a gorge of Walden's Ridge up to the mines. Between Walden's Ridge and the Cumberland Mountains at this point, two streams, Coal creek running north, and Welding creek running south, meet nearly at right angles, and after their confluence pass through the gap before mentioned. Near the point of their union six companies are employed in mining coal.

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Prof. Bradley, who made a survey of this property in 1872, gives the position of the strata and a vertical section of the same, which may not prove uninteresting, inasmuch as his practical skill and accuracy as a geologist is well known. He says:

"That portion of the beds which forms the mass of the Cumberland Mountains, and underlies the included valleys, is approximately level, showing only slight dips, and these local and irregular. As a whole, however, I believe there is a slight westward dip of the whole mass. But in descending the mountain, and approaching the main branches of Coal creek, we begin to find the dips increasing gradually and following two principal directions, corresponding with the courses of Walden's Ridge. Crossing the creek, we find the dips of those portions of the strata which form the Ridge increasing rapidly to 60° and 70°, and, at some points, even to 20° beyond verticality. As these latter portions consist of shales and sandstones, including coal seams, and corresponding in general appearance with the horizontal strata behind them, it is not surprising that the opinion has obtained, among persons who have not made careful examination, that they really constitute fragments of the visible horizontal strata, broken off and dropped on edge. But closer observation shows plainly that along the Coal creek waters, at least, no such break has taken place; while it is also evident that the rocks along the whole length of the Ridge are simply the continuation of strata lying below all the horizontal beds that are exposed on this eastern side of the Cumberland Mountains, bent up in a grand curve by an immense force which acted so slowly as not to break them off. It was the same force which upheaved and displaced the rocks of the whole great Appalachian range. Most of the courses of disturbance follow a general north-east and south-west trend; but there are a few cross fractures, one of which runs from near Coal creek up through Wheeler's Gap, and gives direction to that portion of Walden's Ridge. The lower portion of the Ridge, running towards Winter's Gap, is approximately parallel to the general trend. The two portions unite, not at a sharp angle, but by a gentle curve, accompanied by considerable warping of the broad plates of sandstone, and more or less crushing of the included coal and other softer rocks. In the more nearly horizontal portions of the strata, opposite this junction, two or three considerable wrinkles were developed, which have been encountered as "horsebacks" in the mines opened at this point. They probably do not run very far under the mountain. It is fortunate for the miner that the waters of Coal creek have at this point (the Gap having been located, very probably, by some cross crack corresponding with the aforesaid wrinkles), cut their way down through Walden's Ridge, so far as to admit him directly to the outcrop of one of the principal coal seams, at a level not far from that of the general drainage outside the Ridge."

The following is the general section of the strata, as given by Prof. Bradley. The strata are numbered from above downward, and the coal lettered from below upwards. The only coal now worked is that

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marked E, and which, from an examination, appears to dip towards a central basin at the rate of one and a half inches to the yard. This seam lies about sixty feet above the creek. It varies from four to seven feet in thickness, and supplies a good hard cubical coal. It contains, at one point, a band of cannel coal, varying from a mere streak up to two inches. The other seams have not been drifted into, but Prof. Bradley is of opinion that of the twenty-one, at least eight are of workable thickness, and will aggregate over thirty feet of coal. He estimates the amount beneath each acre of surface to be 6,250 tons.

GENERAL SECTION OF STRATA AT COAL CREEK.

1.	Shales and sandstones, little or no coal	200 ft.
2.	**Coal, (U)**	6 in.
3.	Shales and heavy cliffy sandstones	80 ft.
4.	**Coal, (T)**	1 to 20 in.
5.	Underclay and sandy shales	20 ft.
6.	**Coal, (S)**	3¼ "
7.	Shales, full of irregular ironstone nodules	10 "
8.	**Coal (R)**	1 "
9.	Shales and sandstones	10 "
10.	**Coal, (Q)**	1½ "
11.	Shales and heavy cliffy sandstone	20 "
12.	**Coal, (P)**	2½ "
13.	Shales, with two or three heavy sandstones	300 "
14.	**Coal, (O)**	5 to 7 "
15.	Shales, with few thin sandstones	350 "
16.	**Coal, (N)**	? "
17.	Shales and sandstones	110 "
18.	**Coal, (M)**	? "
19.	Shales and sandstone	100 "
20.	**Coal, (L)**	2 5–6 "
21.	Shale	10 "
22.	**Coal, (K)**	2 1–6 "
23.	Shales and heavy cliffy sandstones	180 "
24.	**Coal, (J)**	3½ "
25.	Laminated sandstone	30 "
26.	Shales and shaly sandstones	220 "
27.	Irregular heavy-bedded sandstone	10 "
28.	Shales and sandstones	50 "
29.	Black bituminous shales	10 "
30.	**Coal, (I)**	? "
31.	Shales and sandstones, thick and thin	160 "
32.	**Coal, (H)**	2 "
33.	Black slaty shale	? "
34.	Sandstone and shales	140 "
35.	Black slaty shale	2 "
36.	**Coal, (G)**	2 to 3 "
37.	Sandstones	40 "
38.	Dark, hard clay shells, with ironstone bands at bottom	130 to 150 "
39.	Laminated sandstone, shaly below	12 to 15 "
40.	**Coal, (F)**	1½ to 2½ "
41.	Shale, clay and coal, interlaminated	1 "
42.	Clay shale	9 to 15 "
43.	**Coal, (E)**	4 to 8 "
44.	Underclay	1 to 2 "
45.	Sandy shale	4 to 5 "
46.	Thin-bedded sandstone, part shaly	30 to 40 "
47.	Dark drab to black clay shale, ironstone bands	30 to 35 "

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48.	Heavy-bedded sandstones	5 to 10 ft.
49.	Thin-bedded flagging stone	12 to 15 "
50.	Clay shales, partly sandy	10 "
51.	**Coal, (D)**	1½ to 2½ "
52.	Underclay	2 to 4 "
53.	Hard, dark shale	15 to 20 "
54.	Shales and thin sandstones	40 to 50 "
55.	**Coal, (C)**	3 to 4 "
56.	Shales	12 to 15 "
57.	Thin-bedded shaly sandstones	8 to 10 "
58.	Sandy shales	30 to 35 "
59.	Heavy-bedded sandstones	30 to 35 "
60.	Dark, compact clay shales	55 to 60 "
61.	**Coal,** mostly brashy, with six inches of fire-clay, **(B)**	1½ to 2 "
62.	Dark shale, sandy below	15 "
63.	Sandstone	8 to 10 "
64.	Shales	15 "
65.	Sandstone	25 "
66.	Shales	70 "
67.	Concretionary shales	15 "
68.	Heavy-bedded sandstones	50 to 60 "
69.	Sandstones and shales, including **Coal, (A)**	200 to 300 "
70.	Limestone, part cherty	100 to 200 "
71.	Sandstones and shales, including beds of iron ore	

There are, then, at least twenty-one coal seams in this section.

The coal A is nearly worthless, being intermingled with large masses of sandstone and shales.

Coal B is thin and worthless, and Prof. Bradley thinks it attains nowhere a sufficient thickness and purity to be of any practical value.

The outcroppings of coal C, in the bed of the stream at the railroad bridge, have been covered with rubbish. It is said to be three or more feet in thickness.

Coal D is not of workable thickness, containing only ten or fifteen inches of good coal.

Coal E is the vein now worked, and noticed above.

Coal F is from eighteen to twenty-eight inches thick, and though a good caking coal, is not worth mining.

Coal G shows a thickness of from two to three feet of good coal. It was once worked to a moderate extent.

Coal H was examined by Prof. Bradley at one point, and showed two feet of good caking coal.

Coal I is probably the equivalent of the seam mentioned by Dr. Safford, as being six or eight miles west of Coal creek. At the latter point it is three feet thick, with a parting of three inches of shale.

Coal J showed upon examination three feet of solid coal. It is a dry, free-burning coal, and well suited to work raw in an iron furnace.

Coals K and L are separated by ten feet of soft shale. The upper one is workable; the lower one not. Prof. Bradley thinks it probable they run together.

Coal M and N were not seen exposed. The latter is thought to be of workable thickness.

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Coal O is from five to seven feet thick, with one heavy shale parting. It lies at a high level, but is valuable.

The coal seams from P to T are found near the top of the mountain. P and S are of workable thickness where exposed.

Coal U is thin and worthless.

Six companies are now mining coal at Coal Creek, viz.: the Knoxville Iron Company, R. E. McEwen & Co., Coal Creek Company, Black Diamond, Franklin Coal, and Anderson County Coal Creek Company.

The Knoxville Iron Company employs fifty-four miners and fifteen laborers. It ships ten car loads of coal per day, averaging 250 bushels to the car load. The main entry, with cross entries, is about 2,400 yards in length. The coal is shipped to Atlanta, Augusta, and Macon, Georgia, and sometimes to Charleston, South Carolina. The fine coal of this company is utilized in the making of coke. This company has a lease of 360 acres.

The mine of R. E. McEwen & Co., a short distance from the preceding one, employs thirty miners and eleven laborers. The product for the year 1873 was 150,000 bushels. The main entry, 900 yards in length, is driven in at a water level, and the cross entries, dipping one inch to the yard towards the main entry, will probably aggregate as many yards as the main entry. This mine is so opened as to drain itself. The full capacity of the mine is 100 tons per day, or 2,500 bushels. This company has a lease of 250 acres.

The Coal Creek Coal Company employs twenty men. The main entry is 425 yards long, with cross entries amounting in the aggregate to 375 yards. The daily product of this mine is five car loads, or 1,250 bushels. This mine is pretty well exhausted, and the company propose to open a new mine higher up and above the Black Diamond.

The Black Diamond Company has twenty miners and eight laborers. It began operations on a lease of 250 acres, in January, 1873. 125,000 bushels have been taken out. The mines drain themselves. The main entry is 150 yards long, with 200 yards of cross entries.

The Franklin Coal Company has recently begun operations.

The Anderson County Coal Company employs twenty-six men, and the maximum product is ten car loads, or 2,500 bushels per day. The character of all this coal is the same. These companies, with the exception of the Coal Creek Company, work under a lease from the Coal Creek Mining and Manufacturing Company, paying a royalty of one cent per bushel.

The total product of the mines at Coal Creek, for the year 1873, was about 75,000 tons. The mines at this point are not worked to near their full capacity, for while the annual shipments amount to nearly 2,000,000 bushels, these could easily, with increased demand, be shipped 3,000,000 bushels.

The following letter from E. C. Camp will give additional information in regard to these mines, as well as an analysis of the coal:

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KNOXVILLE, TENN., December 27, 1873.

Hon. Wm. Morrow, Nashville, Tenn.:

DEAR SIR—The letter from the Secretary of the Bureau of Agriculture, addressed to you, and forwarded to us, is received. Aside from our local demand in East Tennessee; Atlanta, Augusta, Macon, and all intermediate points of consequence in Georgia, Lynchburg, Virginia, and points this side, with a considerable trade at Huntsville and Stevenson, Alabama, and other points on the Nashville & Chattanooga and Memphis and Charleston railroads, with some shipments to Savannah, Georgia, and Columbia, South Carolina, in the order in which named, the principal points of shipment. Price at the banks in winter is ten cents per bushel for lump, nine cents for mixed, and five cents for slack coal. Some reductions are occasionally made to manufacturers who purchase large quantities, and to dealers, in summer, who lay in supplies for winter use. Freight from the banks to Knoxville (thirty miles) is four cents per bushel, with a reduction of one dollar per car if the coal goes to or beyond Bristol, Chattanooga, or Dalton.

The thickness of the seam will average about five feet, and is tolerably uniform. The quality of the coal is almost precisely the same in all the banks, except the Anderson County Coal Company, which seems to be a little freer from dirt, and with less sulphur than the others. The analysis of the coal from the Coal Creek Company and the Anderson County Coal Company (the two banks which I represent) is as follows:

COAL CREEK COAL COMPANY.

Moisture	1.04
Volatile combustible matter	38.87
Fixed carbon	56.44
Ash	3.65
Total	100.00
Sulphur in 100 parts coke	.59

ANDERSON COUNTY COAL COMPANY.

Moisture	.99
Volatile combustible matter	38.82
Fixed carbon	57.52
Ash	2.67
Total	100.00
Sulphur in 100 parts coke	.13

The retail price of coal at Knoxville is eighteen cents per bushel, delivered.

Yours, very truly,
E. C. CAMP.

ANALYSIS.

Sample of coal taken from vein E on the property of Messrs. McEwen & Wiley:

Fixed carbon	57.69	per cent.
Ash	2.55	"
Volatile matter	37.80	"
Sulphur	1.70	"
Phosphoric acid	0.25	"
	99.99	"

The future prospects of the mines at Coal Creek are highly flattering. The coal seams are regular and reliable, and calculations can be made with certainty. With the opening of the Cincinnati Southern line, which will connect with the Knoxville & Ohio, the shipments of coal from this point, as also from Careyville, will doubtless be very large.

WHEELER'S STATION, OR CAREYVILLE. At this point, eight miles above, four mines have been opened, with varying success, viz.: The Powell's Valley Mining and Manufacturing Company, Jamee

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Kennedy's mine, East Tennessee Coal Company, and Dr. Hart's mine.

The first of these is not worked at present, owing to some dispute in reference to the title. The seam is three and a half feet thick, and the mine was opened in 1869.

The mine of James Kennedy is worked by twenty-two men, with a daily product of 700 bushels. The main entry is 500 yards long, and is on a level with the Knoxville & Ohio Railroad. It was opened in 1868.

The East Tennessee Coal Company has met with a series of misfortunes. The first drift, after going 165 yards, struck a fault and was abandoned. The stratum dipped at an angle of ten degrees, and after the entry had been driven in twenty-seven feet the bed jumped twenty-seven feet, nearly perpendicularly. It was, however, worked until the fault was encountered.

The second drift goes in 175 feet. The bed dips at an angle of thirty-five degrees for forty yards, then becomes horizontal or slightly undulating. Six or eight men only are employed, and the product is 250 bushels per day. It was opened in August, 1871.

DR. HART'S MINE.—This seam in one of the mountain spurs has a dip of forty-three degrees downward. It is five feet in thickness, varying, however, from four and a half to eight feet. The coal is of good quality, comparatively free of sulphur, and is highly esteemed for grates, bringing one cent more per bushel in Knoxville than that obtained elsewhere. Where the seam thickens to more than six feet, the coal is curled, twisted and rounded, has a crushed, shelly appearance, and does not bear transportation so well as that taken from where the bed is thinner. The entry at the time of our visit had been driven to a depth of 125 feet, with but little variation in the dip. At last accounts received in December, 1874, Dr. Hart had not reached the point where the stratum becomes horizontal. The total product from Wheeler's Station, for the year 1873, was 368,325 bushels.

The following is a section taken in 1859 by Dr. Safford, and will serve to illustrate the stratigraphical position of the Coal Measures at this point. The strata are nearly horizontal, except at the base, where they dip at a small angle in the mountain, and this dip is increased in the small spurs that shoot out from the mountain as though the edges were turned up by lateral pressure:

45.	SANDSTONE, caps the highest points of the mountain	100 feet.
44.	*Shales and Shaly Sandstone*	55 "
43.	*Sandstone*	15 "
42.	*Shales and thin Sandstones*	165 "
41.	*Shale*	14 "
40.	**Coal,** *a fine exposure,* contains a six-inch seam of black shale, but otherwise pure cubic coal	6 "
39.	*Shale*	40 "
38.	*Thin Sandstones and Shales*; these rocks are in the gap through which the path leads from Wheeler's across to Beech Creek	155 "
37.	*Shale*	45 "

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36.	SANDSTONE	37	feet.
35.	*Shale and Sandy Shale*	74	"
34.	**Coal,** fine outcrop, (may be six feet)	4	"
33.	*Shale and thin Sandstones*	40 to 60	"
32.	*Sandstone*	60 to 80	"
31.	*Shale*	50	"
30.	**Coal,** *outcrop*	1	"
29.	*Fire-clay*	1 to 2	"
28.	*Shale*	50 to 80	"
27.	SANDSTONE	60 to 90	"
26.	*Shales*	130	"
25.	*Shales,* with *clay Ironstones*	20	"
24.	**Coal,** *outcrop*	1	"
23.	*Shale*	6	"
22.	**Coal,** *outcrop* at a large "lick" on Beech Creek side, may be a five or six-foot coal	3	"
21.	*Shale*	50 to 80	"
20.	*Sandstone*	50	"
19.	*Shales, mostly*	100 to 120	"
18.	SANDSTONE	75 to 100	"
17.	*Shale*	45	"
16.	**Coal,** *outcrop,* with shaly parting of three inches	3	"
15.	*Shale and Sandstones,* shales predominating	190	"
14.	SANDSTONE	50 to 80	"
13.	*Shale*	20	"
12.	**Coal**	3	"
11.	*Shale, with clay Ironstones*	25	"
10.	*Sandstone*	25	"
9.	*Shale,* heavy, thickness uncertain, say	110	"
8.	*Shale and "black slate"*	10	"
7.	**Coal,** *outcrop*	1	"
6.	*Shale and Fire-clay*	4	"
5.	*Shale*	5	"
4.	**Coal,** with a three-inch parting in upper portion	5	"
3.	*"Black slate,"* contains *Stigmaria,* with rootlets	3	"
2.	*Shale and Fire-clay,* with *Stigmaria*	6	"
1.	*Sandy Shale,* (foot of mountain)	30	"

The entire thickness of the strata in the section above is about 2,100 feet.

A section taken at Tellico Mountain by F. Chavannes, civil engineer, represents six beds of coal of great richness. Tellico Mountain lies on the northern-western side of Elk Fork Valley, which valley has a great fault running through it. The Coal Measures lie north-west of this fault.

Some doubt, however, has been thrown upon the accuracy of Chavannes observations by Prof. Bradley, who in a note to the Secretary of this Bureau says:

"Chavannes is probably in error about the thick seams of coal on Elk Fork. I have visited the region twice especially to find them, and have been unable to find or hear of any over eighteen inches until reaching the junction of Clear Fork at the Kentucky line where heavy seams are said to outcrop in the *bed* of the stream."

Poplar Creek, Frost Bottom, Morgan Mines, and Piney are mines only used for local purposes at present, though some of them will go into active business in a short time.

In regard to the northern portion of this great Tennessee coal-field,

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it may be said that some of the beds which have been opened for local purposes are from five to six feet in thickness, and show coal of good quality. The want of transportation has suppressed development. In White, Cumberland, Morgan, Putnam, Overton, Fentress, and Scott are many fine exhibitions of coal, especially where the streams have gashed the mountain-top. Coal has been mined for local purposes in all these counties. On Clifty Creek, in White county, and on Caney Fork are some fine presentations of coal. Much of the coal in White county is below the conglomerate. In Calf Killer Valley are several seams of three and four feet in thickness. No extensive mining has been done in this portion of the coal region, and until means of transportation are afforded, this great undeveloped wealth will remain valueless. A minute geological survey of this region would be exceedingly valuable, in an industrial point of view, to the State. Our purpose, in this report, is accomplished when we direct attention to such things as directly affect our agricultural interests. That the erection of manufacturing establishments would stimulate agriculture, and multiply the profits of the farmer, is not to be doubted. The evidence of this is seen in the erection of Rockwood Furnace. Before it was built, the farmers in the vicinity of the spot relied chiefly upon their corn crops for a supply of money. Those remote from the river could not even rely upon that staple, for hauling it over a mountainous country was such a tax as to consume all the profits. Now, it is not uncommon to see, at one time, a hundred wagons in Rockwood loaded with chickens, turkeys, beef, butter, eggs, flour, corn-meal, hay, oats, corn, etc. Twenty-five hundred barrels of flour, 15,000 bushels of corn-meal, and 15,000 pounds of bacon are consumed in a place that, six years ago, was an untamed forest. Lands and rents in the neighborhood have advanced. The valleys are crowned with orchards and gardens, with corn and wheat; schools have sprung up; population is crowding in; the quiet and gloom of the forest have been transformed into the glory of the field and the bustle and activity of a manufacturing town. A thousand such towns could be built in our coal regions, and the crops of the farmers be made to yield a remunerative return for their labor. As for the facilities which this region offers for the establishment, not only of manufactories for iron, but for cotton, wool, and lumber, there can be no question. Contiguous to the cotton-fields, in a region where sheep flourish and thrive upon the mountain grasses almost the entire year, and where timber of almost every variety abounds, such as walnut, poplar, oaks, hickory, ash, and maple, and where, too, the most health-inspiring breezes, free from malaria, invigorate and animate the physical frame; with an unlimited supply of coal and iron ore, it will be anomaly in the history of industrial progress if this elevated region of Tennessee, does not become the seat of extensive manufacturing establishments. Nature has ordained it, and capital and labor cannot long resist it.

J. P. Leslie one of the best geologists in Pennsylvania, says of this region:

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"The juxtaposition of this Upper Silurian iron ore in East Tennessee, with the beds of the Coal Measures, is a striking phenomenon, but one not peculiar to that region. We have before spoken of the great downthrow faults which have brought this result about—faults which run in straight lines for several hundred miles from Alabama to Middle Virginia. It is to these faults that we owe the existence of the Cumberland Mountain Range, and the preservation of the coal-beds. Before these faults took place, the coal was elevated 10,000 to 20,000 feet above the level of the sea, on a plateau covered with eternal snow and ice. When this plateau was cracked along parallel lines running east-northeast and west-southwest, intermediate sections of it dropped to about 3,000 feet above the tide level. The sections which retained their altitude have been eroded of all their Coal Measures, and of the formations beneath the Coal Measures as far down as the fossil ore. Thus, on two sides of each crack the ore and the coal lie facing each other. *Geologically*, they were separated by an immense interval. *Geographically*, they are now but a few furlongs, sometimes but a few yards, apart.

The Coal Measures also have been preserved by the vertical drop of the Cumberland Mountain, almost in their total original thickness. There are nearly 3,000 feet of vertical Coal Measures west of Knoxville. This is in strong contrast with the state of things in Pennsylvania. Our lowest coal beds are well known to run along the summit of the Alleghany Mountain Range, (which is the northern prolongation of the Cumberland Mountains of the Southern States), and the coal basins which lie behind the Alleghany Mountains in Lycoming, Clearfield, Centre, Cambria, and Somerset, are comparatively shallow, never containing more than the lower 1,000 feet of the whole formation, and often not more than enough to take in the first, or the first and second coal beds. The Pittsburg bed, and the Upper Coal Measures, are not preserved to us except in the low country of the Monongahela and Ohio River Valleys.

But in Tennessee, the lowest coal bed comes to the surface at the very roots of the mountain, as if it came out in the workshop grounds at Altoona, or in the Susquehanna river bed at Williamsport and Lockhaven; and along these slopes, at intervals from the base of the mountain to its crest, run horizontal outcrops of numerous coal beds. It is true none of them are very thick; the largest one yet discovered being seven or eight feet thick. But the sum total of mineral fuel preserved for the use of the inhabitants of the south is practically infinite. Every valley and ravine that issues from the plateau lengthens the outcrops and facilitates access to the beds. In course of time, a thousand collieries will be started in the mountain, and a thousand iron works established on the ores at its foot; a thousand villages, towns and cities will grow up in the broad limestone plain before it; a thousand factories and mills will make these towns hum with life, and all this life will base itself on the mountain coal thus wonderfully preserved from destruction by throes of the earth in ancient days, which

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would have obliterated every trace of human life from the continent, had the divine invention of human life been made."

The following table will give the monthly product of coal for the various mines in operation in July, 1874:

Sewanee	300,000	Bushels	Per	Month.
Vulcan	30,000	"	"	"
Ætna	62,500	"	"	"
Battle Creek and mines above	23,920	"	"	"
Coal Creek	156,250	"	"	"
Wheeler's Station	30,694	"	"	"
Soddy	15,000	"	"	"
Sale Creek	50,000	"	"	"
Rockwood	104,000	"	"	"
Wilcox Mining Co	13,000	"	"	"
Oakdale	26,000	"	"	"
Shoal Mine	10,000	for 1873.		

This shows a monthly product of about 821,000 bushels, or about 10,000,000 bushels annually.

The United States census reports of 1870 give the total amount of coal raised for the year which the census returns embrace as 3,335,450 bushels, or 277,871 bushels per month, so that it appears the coal product has trebled in three years. In the estimate made, we do not include those mines that are worked only for local uses, which was done by the census takers. The entire amount mined in 1854 was 247,400 bushels, in 1855 this was increased to 571,952 bushels.

The quantity of coal which the Coal Measures of the State will supply, has been estimated equal to a block one hundred miles long, fifty-one miles wide, and eight feet thick. Assuming that a ton is equivalent to one cubic yard, we have, within the boundaries of the coal fields of Tennessee, 42,127,360,000 tons; and this is not an over-estimate. If this were made into a solid bar one hundred yards wide and thirty feet thick, it would pass through the earth at the equator.

There can be no more deceptive statement, remarks Mr. Macfarlane, which may be at the same time true, than that of the area of the coal field only. Kansas has more square miles of coal than Pennsylvania; yet, one little bed in the latter State, five miles long and less than one wide, is worth more than all the coal in Kansas. The coal fields of Missouri, Nebraska, and Kansas cannot be compared, except in size, to the great Alleghany coal fields, a large portion of which is included in Tennessee. The coal in the latter is better, more abundant, more accessible, and the beds more reliable than in the trans-Mississippi Coal Measures.

The following table will show the various analyses of such coals as have not been given elsewhere:

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COUNTIES.	NAME OF MINE.	CHEMIST.	CARBON.	VOLATILE MATTER.	AGE.
Grundy	Sewanee	F. Zwicke	65.90	29.00	5.50
Grundy	Sewanee	W. M. Stewart	59.38	34.50	6.12
Grundy	Sewanee	R. O. Curry	79.56	14.21	6.25
Grundy	Sewanee	Yaryan	63.50	29.90	6.60
Marion	Upper Seam	W. M. Stewart	59.50	38.00	2.50
Marion	Upper Seam	W. M. Stewart	56.50	41.50	2.50
Marion	Lower Seam	W. M. Stewart	49.50	43.00	7.50
Marion	Ætna	W. M. Stewart	65,00	32.50	2.50
Marion	Ætna	Dr. J. J. Pohle	74.20	21.39	4.40
Hamilton	N'r Chattanooga	T. Sterry Hunt	63.90	26.80	9.30
Hamilton	Sale Creek	W. M. Stewart	56.75	40.75	2.50
Roane	Wilcox	T. G. Wormley	65.80	31.60	2.62
Roane	Roane Iron Manuf'g Co	Unknown	76.39	16.50	3.46
Roane	Wilcox	T. G. Wormley	63.10	28.20	7.70
Roane	Kimbrough's	Troost	71.00	17.00	12.00
Rhea	Gillenwater's	Troost	69.00	14.00	14.00
Anderson	Coal Creek	R. O. Curry	82.00	10.00	7.00

The following letter from Col. A. S. Colyar, will be read with interest and profit. Col. Colyar is more extensively engaged in coal mining than any other one man in the State:

NASHVILLE, TENN., Nov. 20, 1875.

J. B. Killebrew:

DEAR SIR:—At your request I have reread your article on Coal and Iron, in the "Resources of Tennessee," but after correcting some errors of figures, by misprint, there can but little be said in addition, and certainly nothing you have put in ought to be taken out. I think of but one fact which will be of value to the public in addition, and that is founded on evidence more recent than the publication of your most valuable work. The actual test of Tennessee coal for making iron had not then been made, at least not sufficiently made to satisfy iron and coal critics. It has long been the opinion of mechanics who had used coal from the Upper Coal Measures of Tennessee, that it would make very near a charcoal iron. Its freedom from sulphur and other impurities was the subject of noteworthy talk by blacksmiths and engineers, and it was this general opinion of practical men rather than an actual analysis of the coal, which prompted the heavy outlay in getting ready to make coke at the Sewanee mines. By an actual test in these furnaces, one of which has been making iron for market with "top of the mountain coke" for more than fifteen months, and the other for about five months, it has been demonstrated, that the coke made from the upper veins will make an iron nearly, if not quite equal to charcoal iron. The iron has been thoroughly tried in the large rolling mills at Atlanta, as well as in the foundries of Webster & Marks, at Chattanooga, the Nashville and Chattanooga railroad and the penitentiary at Nashville, besides at many other places. The upper veins cover so much territory—extending over several counties, that the trial and result come to be a matter of the greatest moment to Tennessee. It is absolutely certain that in all the vast coal fields of the great west, not one has yet been discovered, well suited for the coke oven and furnace. The block coal of Indiana, it is claimed, will make iron without coking, but the furnaces west of this coal, all go by it, and bring coke from Connelsville, sixty miles above Pittsburgh.

The "upper veins" found wherever the hills on top of the mountain are found, is a peculiar coal, nothing like it being found in the lower veins. It bears a strong resemblance to the Connelsville coal; is soft and easily worked, and would not be called a merchant coal, but makes intense heat as well as much blaze. The two furnaces now in full blast, with this coke, have been able to run and find a market for their products, only because of the superior quality of iron made.

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The value of Tennessee coal for making iron being established, a leading journal of Pennsylvania, the "*Iron Manufacturer*," in a recent article, for the first time, as far as I have seen, denies that we can make iron cheaper than in Pennsylvania. This journal admits our advantages over Pennsylvania in iron, but claims that this is overcome in the price of coke. He takes Pennsylvania coke at about 1.20 per ton and Tennessee coke at about 2.68 per ton, and this is done by taking the one at the lowest price at which coke was perhaps ever sold in Pennsylvania, and which it will be admitted by all is below the cost of making it, and the other is taken as sold at a fair profit, with 100 miles of transportation added. I submit, is this dealing fairly with a young competitor. Any thinking man will at once ask, can't coke be made as cheap in Tennessee as in Pennsylvania.

Pennsylvania has but one place where a first rate iron coke is made, and that being a manufacturing town of course, there is no advantage in transportation on coke.

The iron ore used is brought from Missouri and Michigan, while ours is in the vicinity of the coal fields. In the celebrated Congressional investigation in 1868, the leading iron men of Western Pennsylvania, all stated upon oath, that they could not make iron at a cost of less than from twenty-eight to thirty-two dollars per ton. Last year, just before the panic, I was informed by a number of iron men, among them Jones and Laughlin, that their iron was costing them thirty-five dollars. This was when they were paying $14.50 for Lake Superior ore, and $16.50 for Missouri ore.

By the working of our coke in furnaces now fully tried a Rockwood and Chattanooga, iron is made after paying a profit on the raw material, at from $14.50 to $22. Under ordinary circumstances, in the iron and coal regions of Tennessee, the cost of making iron will not exceed eighteen dollars. Very truly,

A. S. COLYAR.

In the preparation of this article, free use has been made of the excellent Geological Report of Dr. Safford, of the surveys made by Prof. Bradley, and the Coals of America, by James Macfarlane, A. M., D. Appleton & Co., New York. To Mr. Macfarlane we are also indebted for the beautiful map of our coal regions which accompanies this article. It is copied from the Geological Map of Tennessee. The plate was electrotyped at Mr. Macfarlane's expense, and forwarded to the Secretary of this Bureau.

IRON.

Iron has not been inaptly termed the world's great civilizer—the mother of all the useful arts. The consumption of it measures the progress of civilization, as the manufacture of it measures the progress of wealth. Its law of development is traceable to the same agencies that spread population, enterprise, intelligence and learning throughout the world. Those nations that have ascended the highest in the scale of civilization and refinement, and have made the greatest advances in industrial enterprises, are precisely those which have consumed, per capita, the largest amount of iron. In 1855, the annual production of iron throughout the world was 7,000,000 tons.* Of this amount, Great Britain produced 3,500,000 tons, and the United States 1,000,000

*Many of these figures are derived from an address by Abram Hewitt, before the American Philosophical Society, New York.

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tons. The consumption of Great Britain at that period was 144 pounds per capita; of the United States, eighty-four pounds; while the consumption of the world was only seventeen pounds per capita. Since 1855, the production of iron has been doubled, reaching in 1872, 14-000,000 tons; and the consumption has kept pace with the production, England now consuming 200 pounds per head, the United States 150 pounds, and the whole world thirty pounds. Should the whole world require as much iron as the United States per capita of population, the production will have to be increased to 70,000,000 tons, or five times the quantity at present made.

This country has been the only one in the world that has kept pace with Great Britain in the ratio of increase in the production of iron. When the latter country produced 3,500,000 tons, we produced 1,000,-000. In 1872, her product was 7,000,000 tons, and ours was 2,830,-070 net tons, or nearly one-half the product of Great Britain. The number of furnaces in operation in that year was 594, and this number was increased in 1873 to 636. The production of iron for the last named year in the United States was 2,695,434 tons, a slight falling off. If the financial crisis had not occurred, the production of 1873 would have reached 3,000,000 tons.

The following table will show the production of pig metal in the United Kingdom of Great Britain and in the United States in the following years:

Year.	U. Kingdom. Tons.	U. States. Tons.	Year.	U. Kingdom. Tons.	U. States. Tons.
1740	17,350	.....	1852	2,700,000	.....
1788	68,300	.....	1854	3,069,838	736,248
1796	125,079	.....	1855	3,218,154	784,178
1806	258,206	.....	1856	3,586,377	883,137
1810	.....	53,900	1857	3,659,477	798,157
1818	325,000	.....	1858	3,456,064	705,094
1820	368,000	.....	1859	3,712,904	840,627
1825	581,367	.....	1860	3,826,752	987,559
1827	690,500	.....	1861	3,712,390	731,544
1828	.....	130,000	1862	3,943,469	787,622
1829	.....	142,000	1863	4,510,040	947,604
1830	678,417	.....	1864	3,767,951	1,135,497
1831	.....	191,556	1865	4,819,254	931,582
1832	.....	200,000	1866	4,523,897	1,350,933
1833	700,000	225,000	1867	4,761,023	1,461,626
1835	1,000,000	270,000	1868	4,970,206	1,603,000
1839	1,347,790	230,000	1869	5,555,757	2,046,124
1840	1,248,871	286,903	1870	5,963,515	1,850,000
1842	.....	215,000	1871	6,627,179	1,900,000
1845	1,512,500	486,000	1872	7,000,000	2,834,558
1846	.....	765,000	1873	.....	2,868,278
1847	1,999,508	800,000	1874	.....	2,689,413
1850	.....	564,755	1875	.....	2,266,581

The quantity produced in the United States was from twenty-five

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States and Territories. From the most trustworthy information, the iron production of Tennessee, charcoal and stonecoal, since 1871, is as follows:

	Charcoal.	Bituminous Coal and Coke.	Total.
1872	34,094 tons.	8,360 tons.	42,454 tons.
1873	34,532 "	8,602 "	43,134 "
1874	37,227 "	11,543 "	48,770 "
1875	18,011 "	10,300 "	28,311 "

Number of stacks completed—

1873	20
1874	21
1875	21
Number of stacks in blast December 31, 1875	7
" " out of blast	14

Rolled iron, excluding rails—

1873	2,588 net tons.
1874	1,573 " "
1875	1,005 " "

Cut nails and spikes—kegs—

1874	13,210
1875	9,795

About 800 tons of hammered iron are made annually in eighteen Catalan forges.

Railroad iron is made only at Chattanooga in one establishment, which turned out 12,250 tons in 1875.

Recent statistics as to cost of making iron, may be found in the Appendix, as well as analyses of ones.

There are four distinct iron belts or areas in the State of Tennessee, occupying in whole or in part forty-four counties, excluding the Cumberland Table-land.

1. The Eastern Iron Belt—extends through the State, and lies mainly in front and at the base of the Unaka Mountains.

2. The Dyestone Belt—skirts the eastern base of the Cumberland Table-land, or rather of Walden's Ridge, from Virginia to Georgia; spreads out laterally from ten to twenty miles into the Valley of East Tennessee; the Sequatchee and Elk valleys are included.

3. The Cumberland Table-land—is co-extensive with the Coal Measures of the State, and extends into Kentucky and Alabama.

4. The Western Iron Belt—lies west of Nashville, or say west of the Central Basin.

THE EASTERN IRON BELT. This belt embraces the extreme eastern tier of counties, viz: Johnson, Carter, Washington, Greene, Cocke, Sevier, Blount, Monroe, McMinn and Polk; to these we may add Sullivan, which adjoins this belt on the north-west.

Along the North Carolina line is a great double range of mountains, constituting one of the natural divisions of the State, and denominated the Unakas. This range of mountains consists of several long, high, parallel ridges, intersected by deep cuts or chasms, through which the Watauga, Nolichucky, French Broad, Big Pigeon, Little Tennessee, Hiwassee and Ocoee rivers flow out of North Carolina and Georgia into this State. A part of this range is called Smoky Range. The ore banks of the Eastern Iron Belt lie mainly to the north-west of

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this Smoky Range, some of them, however, occurring in the valleys and coves between the more westerly ridges.

The most important ore found is what mineralogists call *Limonite*,* a compound of iron, one form of which, *common iron-rust*, is well-known. In nature it is found in all sorts of forms, sometimes as yellow powder, which, when mixed with clay, is "yellow ochre;" sometimes as a porus sponge-like mass, called *honey-comb ore;* again in a compact, hard stone-like condition. It not unfrequently occurs in curious stalactitic forms, and often in hollow balls, or "pots," sometimes open, dark, lustrous and slaggy in appearance, occasionally with an iridescent play of colors. In all these forms, however, it retains the simple chemical composition of ordinary iron-rust. That composition, when the mineral is pure, that is to say, when there is no clay, or sand, or other foreign substance mixed with it, which by the way is usual, is in percentage numbers as follows:

Iron	59.92
Oxygen	25.68
Water	14.40
	100.00

It contains, therefore, when pure, very nearly 60 lbs. of iron to the hundred. Practically, owing to the presence of impurities, and losses in the reduction, it never yields so much.

The purest possible Limonite, or Brown Hematite, cannot possibly contain more than sixty per cent. of pure iron, the assertions of mineral enthusiasts to the contrary notwishstanding, unless it has undergone the process of roasting, whereby the water is expelled.

This ore does not occur in regularly stratified beds like the Dyestone, to be mentioned, nor in true veins like many other metalliferous minerals, but is met with in irregular masses of all sizes, from small lumps (shot ore) up to blocks ten or fifteen feet in diameter. The matrix is composed of clay, gravel and decomposing rock. A spot of ground, (it may be a knoll, part of a ridge, or part of a mountain slope,) in which the ore is discovered by digging, is called a *bank*. A bank may be defined to be an area beneath which lies a considerable depth of clay, sand and rocky debris, interspersed with which iron ore (Limonite) is to be found in greater or less quantity, the ore presenting itself, as stated, in irregnlar masses. The banks differ much in quantity of ore—some are said to be rich; others are poor, requiring the removal of much foreign matter; others, again, are little else than clay and debris—all require the removal of more or less dead matter before the ore can be obtained. In many banks great excavations, mostly open to the day, have been made, into which large buildings might be thrown. The banks, although in some cases a hundred feet in depth,

* Limonite is derived from a Greek word, signifying meadows, because this ore was first found in boggy or marshy places. The term includes both bog ore and brown hematite.

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are superficial formations, and rest upon stratified limestones, shales, and other rocks. As may be inferred, mining in such banks is rather an uncertain business, both as to the quantity and the exact position of the ore. Nevertheless, the best of them yield an abundance of mineral.

In a given valley, or on a given ridge, there may be from one to a dozen banks, the latter of any length from a hundred yards to a mile. In the Eastern Belt, banks occur in all the counties. Johnson and Carter contain many of them, some of which are exceedingly valuable.

In Bompass Cove, Washington county, are immense deposits of Limonite iron ore. These banks are very rich, and are found in knolls, hills and ridges, which rise above the level of the valley from 50 to 250 feet. The matrix is a deep brown, or chocolate colored earth, and the ore occurs in masses of all sizes, from small grains up to lumps as large as a sugar hogshead. Some of the ore contains lead and zinc, and also iron pyrites. The limestones and Dolomites of the region also contain galena in disseminated grains, and at one point the galena is so abundant that it has been worked as a lead mine, the machinery, however, has gone to ruin. As to the amount of iron ore in this cove no proper estimate can be made, but there is but little doubt that it is practically inexhaustible. And this cove is but a type of the numerous coves which occur from Johnson to Polk.

In Greene county there are very good banks. Two large furnaces have been erected in this county since the war. The ore yields from forty to fifty per cent. of tough grey iron. That used at one of the furnaces in this county is obtained by running a drift 750 feet into one of the hills about 1,000 feet from the furnace. At this distance a mass of almost solid ore, with a matrix of white chalky earth is found, so easily obtained that twelve men get out 30 car loads a day, weighing each 3,000 pounds. The screenings of the ore amount to 2-9 of the whole, and of the screenings about $\frac{2}{3}$ is good ore. The drift passes through 600 feet of Dolomite which dips at an angle of 45 degrees. The deeper the excavations, the better the ore. It is said, however, to be more refractory than the same kind of ore found in Stewart, Montgomery and other counties of the western iron belt.

Limonite, as has been stated, is the principal ore of this belt. In addition to this, the black ore of iron, *Magnetite** of the mineralogists, occurs at one point at Crab Orchard, near the North Carolina line in Carter county. How much of this there may be we are not able to state. Much excellent bar iron has been manufactured from it in a common bloomary. In Sullivan county, in addition to the Limonite banks, are banks of red ores, *Hematites.*† The Crockett and Sharp banks afford this variety, and are capable of supplying much good ore.

*Magnetite takes its name from the property the ore has of being attractable by the magnet.

†Hematite comes from a Greek word signifying blood, because of the blood-like color of the iron ore. The term brown Hematite, as applied to limonite, would appear to be a misnomer.

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In McMinn county is a remarkable deposit of stratified red ore, which, on account of its proximity to the Unaka Range, we include in the Eastern Belt. This is Hill's Bank. The ore is a stratified, fossiliferous rock, much like the ore of the Dyestone Belt, to be mentioned. This bed of ore is noticeable from the fact that it belongs to the Lower Silurian series, while the Dyestone belongs to the Upper Silurian. The main outcrop is a third of a mile or more in length, and at some points fifty or sixty feet wide.

A similar ore of the same age outcrops in the red hills, just south of the railroad between Philadelphia and Sweetwater. It is accompanied by good mangenese ore. The thickness of the bed has never been ascertained, but the abundance of surface ore appears to indicate workable amounts. Hematite, in the form known as specular iron, occurs in the eastern edge of Cocke county, in beds ten feet or more in thickness. The ore is pretty constantly mingled with quartz and feldspar, which are sometimes present in such quantities as to make it worthless, but other portions contain no more silica than can readily be fluxed off in the furnace. The special interest of the ore consists in its extremely small content of phosphorus, only six thousandths of one per cent. according to analyses made by Prof. O. D. Allen, of the Sheffield Scientific School, one of the best analysts in the country. The ore is plainly well fitted for making the best grades of Bessemer steel.

The Tellico ores in Monroe county are varied. The Limonite is most abundant, but there are a few localities where the Hematite and Magnetite are found. The Hematite ore is so compact that blasting powder is used in raising it. It is very pure, having a few seams of yellow ochre and white chalky earth.

Shot ore is likewise found in this vicinity. Donelley's Bank is the name of the principal deposit of this ore. A tunnel has been driven into a ridge, and for a while large quantities were taken out that yield in the furnace fifty per cent.

Many years ago the immense masses of brown Hematite which cap the copper veins at Ducktown, in Polk county, attracted the attention of iron men. Many attempts were made to work it, but the small percentage of copper ore present made the iron worthless. Time may develop processes by which it can be made available, but at present the quality of iron is what is called "red short," and is almost worthless for any practical purposes.

The cost of making iron in the eastern iron belt has been definitely ascertained at two of the furnaces. The furnace at Embreville (now out of blast) is cold blast charcoal, with two teyers driven by water power. The ore is brought from banks at the foot of Bompass cove, three miles south of the furnace and delivered in the furnace loft at two dollars and fifty cents per ton. Charcoal is burnt by contract at five cents per bushel, and delivered at six and a half cents. Good reliable labor can be procured for one dollar per day. The estimate is two tons of ore, and 150 bushels of charcoal for one of iron.

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At the Unaka furnace in Greene county, all the work except that done by the immediate furnace hands, is done by contract. Coal is burnt and delivered at prices varying from six to seven and a half cents per bushel, according to the magnitude of the contract, the highest price being paid on the largest contracts. Though owning rich banks of ore, the proprietor has been supplied by outside parties, who are paid five dollars for every ton of iron made from the ore delivered, or a little less than two dollars and fifty cents a ton for ore. Wood privileges are purchased at five cents per cord or two dollars per acre.

One peculiarity about the ore obtained at Unaka furnace is that no flux is required in its reduction. It is largely intermixed with the black oxide of mangenese, which answers the purpose of a flux. The yield from the furnace will average about fifty-three per cent. and the amount of charcoal used for a ton of pig metal will average about 120 bushels. The furnace is hot-blast, with three tuyers, the blast being driven by a sixty-five horse-power steam engine, the surplus gas from the tunnel head being used to generate steam. The circle at the bottom of hearth is forty-four inches; height of tuyers from bottom of hearth, twenty-four inches; inclination of bosh, 66 degrees; width, nine feet three inches; height of stack, thirty-two feet five inches; size of tunnel head, twenty-one inches. The following will show the cost of making nine tons of pig metal, being one day's work:

Ore for nine tons at $5	$ 45 00
Actual expense to put in furnace, including roasting, washing, etc	15 25
All furnace hands, including engineers, salaried officers, etc	17 50
840 bushels coal at seven cents	58 80
	$136 55
One-ninth of which is	15 17

To this should be added the interest on investment, say, one dollar, and five dollars, the cost of delivering to Greeneville, making the whole cost delivered on the railroad twenty-one dollars and seventeen cents. But, as the work is nearly all paid in goods, upon which a profit of from thirty to 100 per cent. is realized, it brings down the actual cost to very low figures, not more than fifteen dollars per ton in money delivered on the railroad.

Potsdale furnace, within two miles of the Unaka, is out of blast. It used ore from the same banks and had a capacity of about six tons per day.

The quantity of iron made in the eastern iron belt is small, on account of the inadequacy of railroad facilities. While the quantity produced in this region will not exceed 7,000 tons annually, the capacity of the furnaces is equal to the production of 15,000 tons. This charcoal, cold-blast iron is very superior. Its chilling properties are just such as to make it most suitable for the manufacture of car wheels and nearly all the iron made in this region is consumed in Knoxville and at other points for that purpose. It has been pronounced equal to the best made anywhere for car wheels, axles, locomotive tires, and, indeed, for everything in which toughness, elasticity and strength are re-

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quired. A fair test was also given to this iron at West Point, for armory purposes, and proved entirely satisfactory.

THE DYESTONE BELT. This belt of iron ore is remarkable for its length and richness. It skirts the eastern base of the Cumberland Table-land, and extends from Chattanooga to Cumberland Gap, a distance of one hundred and sixty miles. The following counties, or parts of them, are embraced within this belt: Hancock, Claiborne, Grainger, Union, Campbell, Anderson, Roane, Rhea, Meigs, James, Bradley and Hamilton. The belt includes the Sequatchie and the Elk Fork Valleys, which places parts of Marion, Sequatchie and Bledsoe counties within its area.

The chief ore of this belt is a stratified red iron-rock, called at many points Dyestone, being sometimes used for dyeing purposes. It is highly fossiliferous. Like a limestone, or a bed of coal, and unlike the Limonite of the Eastern Belt, it occurs in layers. Its quantity, in any given locality, can therefore be estimated, and the result of a given amount of mining can be calculated with some precision. As a mineral species, the ore is a variety of Hematite, which in plain English is blood-stone, the word referring to the color of the ore. If we take common iron-rust and burn it, we obtain a red rust, the change being brought about by the expulsion of water simply. Common brown or yellow iron-rust is then Limonite, the same burned is red Hematite. By the burning more than fourteen per cent. of water is expelled. The composition of Hematite is as follows:

Iron	70
Oxygen	30
	100

One hundred pounds of the pure ore might be made to yield seventy pounds of iron, but, as in case of Limonite, the impurities defeat this maximum production. In practice from forty to fifty per cent. (and rarely sixty) may be regarded as a good yield. The ore usually soils the fingers readily. At some points it is hard and is quarried out in blocks; occasionally it is soft and easily crushed. The impurities in it are sandy and argillaceous matter and carbonate of lime. Originally much of it contained limestone matter, this having been in the course of ages leached out, leaving red layers as we now find them.

One, and at many points, two or more layers of Dyestone outcrop at the eastern base of the Table-land, almost without a break, throughout its whole extent from Virginia to Georgia. Also in many of the minor ridges, lying from one to ten miles from the Table-land but running parallel with its eastern border, are other outcropping layers. The latter will perhaps, in the aggregate, equal an outcrop extending continuously through the State and following the direction, as above, of the outline of the Table-land. In addition there are lines of outcrops in Sequatchie and Elk Fork Valleys. Elk Fork Valley is in the extreme north-western part of Campbell county.

One of the richest deposits of this ore occurs within a few hundred

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yards of Cumberland Gap, and extends without a break twenty miles along the mountain, and is half a mile in width. It forms a regular stratum of Walden's Ridge, four feet beneath the surface and varies from eighteen inches to three feet in thickness. This stratum is parallel with the slope of the ridge, and forms a complete sheet or shield, with an overlying stratum of clay, sand, and gravel. The ore is raised with powder and thrown out in large, broad sheets. It is here very hard and massive. The whole cost of raising this ore at Cumberland Gap, and depositing it in the bridge loft ready for smelting, is one dollar per ton. This fact will be appreciated by the reader when he reflects that ores delivered ready for smelting in the Pittsburg furnaces cost from eight to twelve dollars per ton. On the spurs which shoot out from the Cumberland Table-land are deposits of Limonite iron ore of superior excellence, yielding from the furnace fifty per cent. This ore caps the hills, forming a ledge with intermingling gravel from sixteen to eighteen feet in thickness. Some of these beds are said to have an unusually small quantity of dead matter. In other places in the same vicinity are said to be deposits of the black oxide, and silicious iron ore, which have never yet been tested in a furnace.

Limestone for flux and sandstone for hearths are found all through the Dyestone region. Coal, too, abounds in juxtaposition to the iron ore, though preference, until the establishment of Rockwood Furnace, was given to charcoal, for the manufacture of which there are ample supplies of timber. Until the erection of Rockwood Furnace, since the war, stone coal had never been used in this State for the smelting of iron.

Very fine deposits of this Dyestone ore occur in the Half Moon Island region, both on the Island and on the mainland. Being on the river, it is easily transported at small cost to Chattanooga and other points.

A heavy bed of ore along this line of outcrop occurs on Col. Welcker's land just above Kingston. H. E. Colton and others are erecting at Kingston a twenty-ton charcoal-furnace to use this ore.

But we cannot pretend, within our limits, to point out all the advantages which this region affords for the manufacture of iron, or to enumerate all the exposures of ores. What has been said is sufficient, perhaps, to give a general idea of the facts. The thickness of the layers varies from a few inches to four and five feet, sometimes swelling out locally from eight to ten.

So far we have spoken of the Dyestone as occuring in Tennessee; but it has a great range outside of the State. It extends south-westward through the north-west corner of Georgia far into Alabama, and is represented by several lines of outcrops. It is the Red Mountain ore of Alabama, and has yielded many hundred tons of iron in that State. To the north-west it extends into Virginia, and indeed through it, reaching into eastern Pennsylvania, where it is extensively reduced in splendidly appointed furnaces.

The layers of ore are attended with shales and thin sandstones,

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which, with the ore, make up the *Dyestone Group* or formation. This is a part of the Niagara geological series. The Dyestone Group is often associated, in the ridges, with two other formations, the *Black Shale* and *the Siliceous Group*, both of which lie above it. The three make a *trio* of formations often met with.

Prior to the war there were in the Dyestone Belt five blast furnaces and fifteen bloomaries. The quality of the iron made was excellent. Soon after the end of the war attention again began to be directed to the Dyestone beds, and it was not long before a new era in iron making was inaugurated in a portion of the belt, by the building of a superior furnace in Roane county at Rockwood. Including the one at Chattanooga, there are still five furnaces in the Dyestone Belt, only one of which uses charcoal.

There will always be a difference of opinion as to the cost of making iron, but we propose to give the reader the benefit of such facts as we have been able to collect by a visit to the furnaces, and by an inspection of the books of the superintendents.

The daily product at the Cumberland Gap furnace is about three and one-fourth tons. This furnace is cold blast. It uses charcoal as fuel, the cost of which is six cents per bushel. Cost of raising ore, fifty cents; cost of delivering, fifty cents. Two hundred bushels of charcoal and two tons of ore are required to make a ton of iron. Labor at the furnace for each ton of iron costs $3 35. Flux costs one dollar per ton delivered. Forty cents per cord is paid for cutting wood. The estimated cost of making a ton of cold-blast charcoal pig-iron at this point is as follows:

200 bushels of charcoal, at 6 cents	$12 00
2 tons of ore, at $1 per ton	2 00
One-fourth ton limestone, at $1 per ton	25
Superintendence and labor, per ton	3 35
Interest on investment	80
Incidentals and repairs, per ton	1 00
Total	$19 40

The iron made at this point is shipped out by Powell's river to Chattanooga.

The cost of making iron at Rockwood, in Roane county, according to the statement of Gen. Wilder, (see letter to Crutchfield,) was in 1872 $14.13 per ton; in 1873 $15.92, and more recent estimates place it as high as $18.00.

There is now in operation a furnace at Chattanooga, erected during the year 1874 at a cost of $100,000, with a capacity of twenty-five to thirty tons per day. It is hot blast, stone coal, and blown with four layers, and three nozles. The blowing cylinder is six feet in diameter, four feet stroke, and thirty revolutions per minute. The following charges were made, after two months run, in twenty-four hours, the yield being twenty tons. The prices is for all material delivered in the stock-houses:

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1760 bushels of coke, at 10¾ cents	$189.20
Ore (brown hematrite) 42800 lbs., at $3.20 per ton	61.14
Ore (red hematite) 37450 lbs., at $3 per ton	50.15
Limestone, 36380 lbs., at $1 per ton	17.00
Labor and salaries	48 00
Interest	22.00
Repairs	20.00
	$407.49

Divide by 20 and the quotient $20.37 will represent the total cost of making iron at that point with mixed ores while the furnace was running at only four-fifths of its capacity. The yield of ore from the furnace amounted to 55.8 per cent. The limestone used contained 95.4 per cent. of carbonate of lime, 3.3 magnesia, and a small quantity of alumina and silica. The ores work easily, the blast at no time exceeding 600 degrees, as indicated by the pyrometer. The quality of the iron produced has the appearance of the Scotch pig, and is far superior to the common mill iron usually made by hot blast from stone coal. This Chattanooga iron brought in the market from $30 to $35 per ton at a time when the iron market was most depressed. It was the opinion of the officers that more fuel was used than necessary for the reduction of the ores, and this amount was gradually lessening at the date of our visit. The limestone is obtained in the city of Chattanooga, the brown hematite (limonite) from Georgia, and the red hematite from near Pin Hook landing, eighty miles above Chattanooga on the Tennessee river.

We have already said that the Dyestone Belt lies at the very base of the Coal Measures. Here, then, are sandwiched, coal, iron ore, limestone and sandstone, the latter suitable for hearths. This circumstance adds much to the interest of this region. Nothing is lacking to make it one of the most famous metallurgical centres in America but facilities for transportation, capital and enterprise. The Cincinnati Southern railroad is already under contract through this iron belt, and doubtless in a short time the iron horse, with his civilized shriek, will run over beds of ore as rich and as exhaustless as any that exist on the continent. A chain of fiery furnaces will then be built that will illumine the whole eastern margin of the Cumberland Table-land. The light of one will reflect back the light of another. The wildness of the forest will be replaced by enterprising industry, and there will gather along this line busy communities. Flourishing towns will spring up, in which manufacturers from the colder regions of the north will rear their establishments for the fabrication of fire-arms, cutlery and farming implements. Under the shadow of the mountains a new empire of industry will spring up, in which there will be no idlers. With the creative power of coal the iron rocks that have slumbered for unknown ages beneath the surface will be fashioned into articles of utility and value. Ponderous trip hammers will shake the earth, and the eternal whir and buzz of machinery will make the very atmosphere redolent of life and enterprise. Farms in the long, rich valleys will teem with luxuriant crops, that will find a ready market near, at good prices, and commu-

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nities that now live from hand to mouth will revel in all the blessings, superfluities and luxuries of life.

Nor is this a fancy picture. Under a good government, in a happy climate, wherever coal and iron lie in juxtaposition, and are made accessible by railroad communication, great centres of population are established. See Pittsburg, how opulent! Mr. Valentine, the able superintendent of Wells and Fargo's Express, says of it:—"If you would see what coal can do for a people who turn it to full account, look at Pittsburg, a city with its environs of 300,000 inhabitants built up by miners of coal. There are no drones in its hive—heads and hands are busy. It lost $30,000,000 by the war without shaking its credit. No city on this continent contains more solid wealth according to its population." If coal can do this for Pittsburg, surely coal and iron can do the same for this portion of Tennessee, and Knoxville and Chattanooga will gather into their laps an almost fabulous wealth, and in time become the Sheffields and Pittsburgs of the South.

The following is the letter from Gen. J. T. Wilder referred to:

ROCKWOOD, TENN., March 10, 1873.

Mr. Tom Crutchfield, Commissioner of Agriculture, Tennessee:

DEAR SIR:—Your favor, asking me to give you a general outline of the mineral resources of East Tennessee, is received. With diffidence I undertake the subject, knowing my inability to do it half justice, yet feeling anxious to assist, in such manner as I may, the early development of the vast mineral resources of this wonderful country.

East Tennessee is partly a high Valley, elevated 1000 feet above the sea, running north-east and south-west about two hundred and eighty miles from Chattanooga, on the southern line of the State to Bristol, at the north-eastern end, the line of Virginia, with an average width of sixty miles. It is bounded on the south-eastern side by the lofty chain of the Unaka range of mountains, reaching sometimes an elevation of over 6,000 feet above the sea, with frequent gaps, through which numerous rivers flow to the north-west. Still further to the south east, about fifty miles in North Carolina, is the unbroken chain of the Blue Ridge, over six thousand feet high. On the north-western side of the Valley is the level-topped Cumberland mountain plateau, sixty miles wide, with its south-eastern side next to the Valley of East Tennessee. For a distance of 130 miles from Sale Creek (thirty miles above Chattanooga) to Cumberland Gap, it is tilted up or folded back against the horizontally stratified Cumberland mountains. This uplifted edge is called Walden Ridge, and is the south-eastern limit of the great Apallachian coal field which runs entirely across the State, from north-east to south-west, with an elevation of 2,000 feet, and an average of fifty miles wide by one hundred long, making a coal field of over 5,000 square miles, or 3,820,000 acres; which is nearly equal to the productive coal area of Great Britain, including England, Scotland, Wales and Ireland.

The Valley of East Tennessee is corrugated throughout its entire length with a number of low ridges running parallel to each other N.E. and S.W. with the Valley. The rivers from the valley of western North Carolina, at the base of the Blue Ridge, cut through the Unaka chain, and through the numberless ridges of the Valley, until they unite in the Tennessee river, at the base of the Cumberland coal field, following which to the southern limit of the State at Chattanooga, the last named river suddenly turns its course and hews its way through the Cumberland chain to the north-west. Here, in the heart of the great Valley of the Mississippi, it offers its clear, deep current to bear the commerce of 15,000 miles of navigable waters back through 800 miles of cotton and corn fields, through five great states, to its mountains of coal and iron, veins of copper, placers of gold and hills of marble, in a climate like Northern Italy; adding with its branches 1,800 other miles of navigable waters to the wonderful network of great rivers that form the national highways for the products of more than half the states of this Union, and bearing a tonnage greater than that of any nation of Europe.

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This wonderful Valley of East Tennessee is lowest near the base of the Cumberland mountain, containing the coal fields on its north-west side. All its streams head in North Carolina and Western Virginia, and drain north-west into Tennessee, each river forming a natural highway down stream to the coal fields. Nearly every ridge in the Valley contains minerals of some kind, the cuts through which the rivers flow forming natural openings to the veins of iron ore, which outcrop in nearly every ridge, whilst the great Alleghany chain is ribbed and seamed with iron ore of nearly every known variety. From the same range are taken large quantities of copper at Ducktown, whilst all along its northern base runs a great, broad belt of roofing slate and most beautiful black marble intersected with snow-white veins. Along the base of the Cumberland range runs entirely through the State, a low range or ridge of about 200 feet altitude above drainage, containing invariably two seams of red fossiliferous iron ore, varying in thickness from three to ten feet, cropping out through the crest of the ridge on its southern slope, and dipping at an angle of about forty-five degrees to the north-west. It is supposed to extend under the coal field; at all events, it crops out at precisely the same geological horizon on the opposite side of Walden's Ridge, in Sequatchie Valley and in Elk Valley opposite Knoxville, localities 100 miles apart, and each ten miles from the place of disappearance of the ore at the south-east base of the mountain. The coal in Walden's Ridge is a dry, semi-bituminous or rather semi-anthracite, working raw in the blast furnace, and requiring at Rockwood about two and three-fourths of a ton of coal to make one ton of pig-metal. The ore averages a yield of sixty per cent. of iron, and the sub-carboniferous limestone furnishes ample and excellent fluxing material, requiring twenty to twenty-five per cent of flux. Nowhere along this long line of 160 miles is it more than half a mile from the iron ore to the coal beds, while the massive limestones are invariably between them the entire distance. The coal at Rockwood is very much disturbed, varying from one to over one hundred feet in thickness. Our No. 1 furnace has been in blast most of the time for over four years, making a fine quality of pig-iron for rails with only one kind of ore. No. 2 furnace, of forty tons capacity, will be put to work early in the spring, when we will turn out, with both furnaces, seventy-five tons of pig iron per day.* At the base of the Unaka chain, on the south side of the Valley, is a wide chain of high knobs, in many of which are wonderful beds of the finest brown Hematite iron ore, some of which contain manganese. In the Unaka chain are inexhaustible *veins* of brown Hematite, and in the high mountains of the Blue Ridge are large veins of magnetic iron ores. All these must go with the rivers to the coal fields on the north-west side of the great Valley, for this reason—that it requires one ton and a half of good iron ore to make one ton of pig-iron, and it takes about three tons of coal to reduce it, and three to four more tons of coal to convert and finish it into bar iron; thus using seven tons of coal to produce one ton of merchantable iron, and one-third of a ton of limestone, making in all seven tons and a half of fuel and flux. These are found contiguous to large and persistent beds of iron ore, only requiring a mixture of one half of the brown Hematite and Magnetic ores to make merchantable iron, fit for any use in arts and commerce, and giving the advantage to manufacturers located near the coal in proportion to the greater tonnage of fuel and flux used, to the vastly lesser weights and freight of ores required to produce one ton of iron; in other words, saving in the production of pig-iron one half the transportation, and in bar or plate iron or nails, nearly 500 per cent. This is the advantage enjoyed by the manufacturers on the north-west side of the Valley, over those located on the south-east side, where there are plenty of ores and no coal. Thus is insured to the north-west side of the Valley, along the proposed route of the Cincinnati Southern Railroad, a continuous line of works and a dense producing population. A few words might be added, giving a geological outline of a cross section of this Valley and its mountains on either side. Commencing in North Carolina, with the range of the Blue Ridge is an enormous Eozoic upheaval ribbed with iron ores; thence north-west crossing granite formations to the metamorphic rocks of the Smoky or Unaka chain, walling long veins of copper and iron ores; thence through great beds of roofing slate, across the Silurian ridges of the broad Valley, to the single lines of Devonian shales at the base of the Cumberland range. In the steep wall of this mountain you cross three workable veins of finest coal, cropping out above drainage, and reach the level top of the coal fields, having less than one hundred miles passed from the lowest primitive rocks across the Metamorphic, Silurian, Devonian, and Carbonif-

* No 2 is now in operation, and turns out an average of 30 tons per day, though as high as forty and a half tons have been the result of twenty-four hours work.

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erous formations. These turned up on edge show all the wonderful provisions of nature in minerals, ready for the hand of man, deposited and hidden in the past ages, but unsealed and opened by the Creator's engineers and contractors—the earthquakes of the past and rivers of the present—and asking in mute eloquence for the mind and hand of man to take from their abundance and make them useful. These ranges and valleys are in a climate unequalled in salubrity and average comfort of temperature—the driving storms of the great plains of the North-west being shut off by the continuous chain of the Cumberland mountain, and the raging gales of the Atlantic seabord stopped short of our valleys by the range of the Blue Ridge and Unakas. These causes render this high mountain-walled Valley not only more temperate in winter, but much cooler in summer than any valley south of the great lakes or east of the Pacific coast, and free from malaria, while the greater number of medicinal springs of almost every known property or variety, makes our valleys a favorite resort for persons seeking either health or pleasure.

I have written these disjointed papers in a great hurry, being unable either to copy or correct, and send them as crude ores to be refined by workers in words, hoping they may direct more capable persons to call just attention to our enormous resources, I having, pioneer-like, but "blazed out" the road.

I am earnestly yours, J. T. WILDER.

Appended please find a copy from our books of the workings of our furnace for the past two months:

Monthly Report of Rockwood Furnace for the Month ending Saturday, December 26, 1872.

Material, etc.	Pounds.	
Ore charged	2,144,000	$2,835 86
Coke "	891,200	2,005 20
Coal "	1,339,200	1,101 80
Limestone	552,700	304 59
Labor	.....	1,170 15
Salaries	.....	400 00
Material from Store	.....	303 37
Blacksmithing	.....	118 56
Foundry Castings	.....	98 03
Total	.....	$8,337 59

Produce, 590 tons No. 1 mill iron, cost, $14.13 per ton. Ore yielding 62 40-100 per cent.

Report of Rockwood Furnace for the Month ending Saturday, January —, 1873.

Material, etc.	No. Pounds.	
Ore charged	2,145,500	$3,194 80
Coke	1,408,800	3,169 80
Coal charged	1,636,600	1,405 77
Limestone	601,800	331 61
Labor	.....	1,486 10
Salaries	.....	580 00
Materials from Store	.....	127 95
Blacksmithing	.....	68 15
Foundry castings	.....	98 03
Total	.....	$10,433 38

Product, 655 tons No. 1 mill iron; cost, $15.92 per ton. Ore yielding 62 78-100 per cent. Ores are charged at three dollars per ton, and actually cost by contract two dollars per ton. All allowances are made to cover any possible waste or cost of extra handling.

The cost for January is unusual, owing to the greater amount of coke used in that month, to reduce the amount of stock of coke on

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hand. Ore yielded for the time quoted above 62 59-100, and an average of 2.715 tons of coal used for each ton of iron produced.

W. F. SANKS—for D. E. REES, Agent.

J. T. WILDER, Superintendent.

We may add here that the heaviest collection of ores which were seen at the Vienna Exhibition, in 1873, came from Tennessee, and was under the charge of General Wilder. The collection was honored with a premium, though it arrived very late.

The following table will show the number of furnaces now in East Tennessee, and also, those in procoss of construction, with their capacties, etc.:

COUNTIES.	NAME OF FURNACE.	FUEL.	BLAST.	KIND OF ORE	AVERAGE YIELD PER MONTH.	REMARKS.
Carter.....	Knoxville Car Co...	charcoal ...	cold ...	limonite.....	200 tons...	in blast...
Johnson....	Bushong.....	do	do	do	100 do	do
Washin'ton	Embreville.....	do	do	do	200 do	outof blast
Greene.....	Unaka.....	do	hot.....	do	270 do	in blast...
Greene.....	Postdale.....	do	cold ...	do	200 do	outof blast
Claiborne..	Cumb. Gap. I. W...	do	do	red hemetite	112 do	iu blast...
Roane	Oakdale.....	coal, coke..	hot.....	do	900 do	outof blast
Roane	Rockwood No. 1.....	do	do	do	576 do	do
Roane	Rockwood No. 2.....	do	do	do	900 do	in blast...
Hamilton...	Chattanooga IronCo	do	do	mixed ore...	750 do	do
Roane	Kingston Furnace....	charcoal....	do	do	600 do	in pro.con.
Rhea.....	Rhea Iron Co.....	coke, coal..	do	red hematite	900 do	do

THE IRON ORE OF THE CUMBERLAND TABLE LAND. The ore found in this region lies interstratified with the shale, sandstone and coal of the Coal Measures. It is called clay iron-stone, and is an argillacious carbonate of iron. It occurs mostly in nodules, but sometimes in layers, and is co-extensive with the coal fields. The low per cent. of pure iron found in it, rarely over thirty per cent., usually twenty, and its comparative scarcity, have caused it to be neglected by our producers of iron. In England the largest quantity of iron is made from this ore, and doubtless the time will come when the iron-stones of Tennessee will be smelted in our furnaces. This, for iron ore, is the least valuable of our iron belts. It covers over 5,000 square miles.

THE WESTERN IRON BELT. A line drawn from Clarksville, Tennessee, to Florence, Alabama, would pass through the center of the Western Iron Belt. It is about fifty miles wide, and extends through the State, often overleaping the Tennessee River, passing into Kentucky and reaching to the Ohio River. It embraces an area of more than 5,400 square miles. It includes all or parts of the following counties: Lawrence, Wayne, Hardin, Lewis, Perry, Decatur, Hickman, Humphreys, Benton, Dickson, Montgomery, Houston and Stewart. On the eastern side of the Central Basin, at the foot of the Cumberland Table-land, is the counterpart of this Western Iron

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Belt. It embraces the counties of Warren, White, Putnam, Overton and Van Buren.

Could one be elevated so as to have in view the whole of this part of Tennessee, he would see no such mountains as present themselves in the eastern part of the State, but reaching north in Kentucky, and south into Alabama, would be seen an elevated plateau country, covered for the most part with forest trees, though showing some cultivated areas, and here and there a town. In sight to the east and bounding the plateau on that side would lie the depressed and fertile Central Basin, holding the capital and many towns, while, to the west, would lie across the State, and bounding the elevated area in that direction, the narrow broken valley of the Tennessee river.

It would be seen, furthermore, that this plateau country is not a little cut and dissected by the valleys of rivers aud creeks. Duck river runs through it in a serpentine course, with gleaming brightness, from east to west. The Cumberland river, with its valley, cuts it completely if we include its Kentucky extension. Buffalo river and valley lie wholly within it. Besides these, very many creeks with narrow valleys curve its edges and fringe it with multitudes of ridges and spurs. This cutting has in some parts of the area resulted in the formation of rolling lands, especially along the larger streams. There is presented along the Cumberland river, for example, at intervals, a border of such land several miles wide.

The rocks underlying the plateau region are limestone, more or less charged with flint-masses (chert,) and fine siliceous and clayey impurities. They belong to the two lower divisions of the Carboniferous system, which are known to geologists as the Siliceous Group and the Lithostrotion Bed, which are described and known as the Barren Group, and the Coral or St. Louis Limestone. The whole country has been undergoing a leaching process for ages. The purer limestone matter has been dissolved and carried away, while the chert, siliceous material and clay have been left behind. The rocks now are generally covered with a very considerable depth of such residual debris.

The Iron Belt may be considered as coinciding, for the most part, with this area. To it, however, must be added certain hilly tracts on the west side of the Tennessee in Decatur and Benton. Over this whole region more or less ore occurs. But only at certain centers is it found in sufficient quantity to be made available. These centers present accumulations of ore, and are for that reason called "banks." The ore, like that occuring for the most part in the Eastern Iron Belt, is Limonite, sometimes called, as we have said, Brown Hematite. The banks, too, though the kind and the position of the rocks, the topography of the country, and other circumstances, make some difference, resemble those of the Eastern Belt. They have generally a high position, being located, with few exceptions, on the tops or edges of the plateau ridges. To appreciate their geological relations, it must be borne in mind that these ridges are capped with the leached remains, the debris, of the rocks of the Siliceous Group, these remains consist-

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ing of angular fragments of half-decomposed, and often bleached, chert and sandstones imbedded in clay, with which is sometimes sand. To this is very frequently added water-worn gravel. The bed of debris is from a few feet to 100 feet in depth, and in it as a matrix the iron ore has, at the centers mentioned, accumulated and formed the banks. It may be added that some localities do not abound in chert; a few afford ore in red clay alone.

The banks vary greatly in the richness of ores and in their extent. Some of them cover whole square miles, while others occupy only an acre or two. Oftentimes the ore is intermixed with hard cemented cherty masses, and yields but a poor return from the furnace. Again it is comparatively free from impurities, yields, when worked, from forty to fifty-five per cent. The lumps, as taken from the beds, are of various sizes, from a few inches to a yard in thickness, and in all possible shapes. In Wayne county, near the Wayne Furnace, at the depth of thirty or forty feet beneath the crests of the ridges, large masses are found so strongly cemented as to require the use of the drill and blasting powder to raise them. The best banks in this locality are found two miles south-east of Wayne Furnace. The ore lies in wave-like masses, running mostly parallel with the surface. But these masses sometimes approach and run into each other and then separate, leaving between accumulations of clay and flint. The ore has been dug to the depth of thirty feet with no apparent diminution of quantity. Outcrops of iron ore occur upon nearly every hill around the furnace, and these indications extend at places down to the beds of the streams. The gravel overlying the ore is sometimes white and water-worn, but generally of a pale yellowish appearance. Practical iron men consider the quantity of ore inexhaustible. It is a Brown Hematite or Limonite, and yields from the furnace 44 per cent. Near Clifton is a bed of anhydrous red oxide of iron that is very valuable. A shaft has been sunk in this bed to the depth of twenty-five feet without reaching the bottom of the ore. Much of this ore is very soft, and can easily be reduced to powder and used as a pigment.

In more than a half dozen places in Lawrence county the iron deposits are sufficient to run a number of furnaces of the largest capacity for many years. Many years ago there were several forges in operation in that county, and the iron always commanded a better price than any other with blacksmiths. The ore is Limonite, and it exists in all its forms in different banks. In the McKey and Powell banks, on Shoal Creek (now owned by Chancellor Nixon), it exists in masses of all sizes and in layers of great thickness. The Wright bank is of great richness, and of a similar character, but the Wisdom bank, some two miles from the Wright bank, is composed of layers from an inch to several inches in thickness, and was called in the iron-making days of Lawrence, plate ore. It is of a dove color, and was so called in contradistinction to the lump ore. The excavations have not reached any great depth, but the workings have been near the surface. The deeper the excavations the better the stratum becomes. The Kelley, the

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Warren and the Flipp's bank, as well as many others, are of the same variety of ore. These banks are so situated that any amount of timber can be obtained for coaling purposes at reasonable figures.

In the southern part of Lewis county, near Napier Furnace, the top of nearly every ridge is a rich bed of Limonite iron ore that will yield from forty-five to fifty-five per cent. of pure iron. The ore is confined to the rolling lands. Between Allen's Creek and Brush Creek the richest banks are found.

Of all the counties of the Western Iron Region none can surpass Hickman in the quantity and richness of its iron ore. Almost everywhere this iron ore crops out. The tops of the ridges are filled with it. It lies in beds or banks and bluffs more or less associated with cherty masses, and will yield from the furnace about forty-four per cent. The old Ætna mines that were worked many years ago are the best yet found in the State. Competent judges assert that there is more iron ore in this county than in the Iron Mountain of Missouri. Before the war there was one furnace in operation in the county that made 1,500 tons annually. But for the heavy expense of hauling to the railroad, there would be now many in operation. Timber is abundant, the ore is rich, inexhaustible, and easy of access. It is believed that twenty furnaces could be run indefinitely upon the ore found in this county.

Dickson county also has numerous rich ore-beds, and two furnaces are kept in operation. In Montgomery county some extraordinary beds are found. The one known as Steele's Bank, lying on Yellow Creek, and one mile from Sailor's Rest Station, on the Memphis Division of the Louisville, Nashville & Great Southern Railroad, deserves special mention. This bed has been penetrated to the depth of twenty-three feet without reaching the bottom of the ore. The ore lies in horizontal strata, eighteen inches in thickness, and the strata are separated from each other by a half inch of red clay, and this thin layer of clay constitutes the whole amount of dead matter. Captain Gracey, who has had charge of the workings of the banks, raised 1,500 tons, a fair sample of which, upon analysis, yielded 57½ per cent. of pure metallic iron. The ore is entirely free of flint. Mr. Oltawoth, of Pittsburg, expresses the opinion that the ore found at this place is the best that has come under his observation, with the exception of the pipe ore used in the manufacture of the boiler Sligo iron. Less than two tons of ore are required to make one ton of iron, and it needs no calcining before being used in the furnace. The limits of this bank have not been reached on any side, and from present indications the thick bed extends in every direction for miles, for this same character of ore is found cropping out on the property adjoining. In working the bank, a shaft eighty-five feet deep was sunk on a hill, and in the valley below, another thirty feet deep, both striking the solid stratum of ore. Hitherto the ore was thought to be confined to the hills. It is Limonite or Brown Hematite, and is believed to be practically inexhaustible. In 1854, seven furnaces were in operation in this

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county that produced annually over 8,000 tons of pig metal. This number has been reduced to one, the Mount Vernon Furnace which has a capacity of 360 tons per month.

Stewart county has for a half century been noted for the richness and abundance of its iron ores. In 1854, fourteen furnaces were in operation in this county, making charcoal iron, besides rolling mills. The species of ore found is the Limonite, which occurs in various forms, such as pipe, honey-comb, bog, compact, pot, etc. On Long Creek, one and a half miles from the Cumberland River, a rich deposit of pipe iron ore has recently been found, which yields from the furnace about forty-nine per cent. of pig metal. The ore is dug and delivered at $2 per ton. The banks at Bear Spring Furnace, on Bear Spring Creek, are very rich and apparently inexhaustible. Near LaGrange Furnace an ore bank has been opened on Leatherwood Creek, two miles from the Tennessee River, which presents a face 100 feet wide and thirty feet high. The ore is so compact that gunpowder is used to raise it. The richness of this bank may be inferred from the fact that seventeen hands only are required to supply a furnace of thirteen-ton capacity with ore.

The ore in Decatur county is singularly free from flint, sand, sulphur and phosphorus. Near Brownsport Furnace is a bank from twelve to twenty feet in thickness, and resting upon a limestone bed. This bank is capped with a cherty mass, and there is an unusually small proportion of dead matter. Ore has been used from it for forty years. It would be impossible to point out all the localities in this region where iron ore exists. It will be sufficient to give an idea of its quantity, to say that ten miles back, on each side of a line drawn from Clarksville to Florence, Ala., would furnish wood and ore enough to run a furnace for every ten miles in length of such a line. This whole region is a wide field of undeveloped wealth and capable of supplying with material, establishments enough to supply the world with iron for a century.

There were before the war, thirty-five furnaces in this belt, besides four bloomeries and thirteen refineries. Of the furnaces, Stewart county had the greatest number; Montgomery came next; then Dickson and Decatur, each having two; and finally Hardin, Wayne, Lawrence and Perry, with one each.

There were in blast in the year 1874, eleven furnaces in this western iron region. The names, average production, etc., of which are given in the table on next page.

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NAME.	COUNTY.	FUEL.	BLAST.	CAPACITY PR MONTH
Brownsport Furnace	Decatur	charcoal.	Hot	540 tons pig
Wayne Furnace	Wayne	"	Hot	540 tons pig
Napier's Furnace	Lewis	"	Cold	270 tons pig
Cumberland Furnace	Dickson	"	Hot	360 tons pig
Worley Furnace	Dickson	"	Cold	240 tons pig
Mt. Vernon Furnace	Montgomery	"	Hot	360 tons pig
Dover Furnace	Stewart	"	Cold	300 tons pig
Rough-and-Ready Furnace	Stewart	"	Hot	300 tons pig
Bear Spring Furnace	Stewart	"	Cold	360 tons pig
Clark Furnace	Stewart	"	Hot	510 tons pig
LaGrange Furnace	Stewart	"	Hot	450 tons pig

Aggregating monthly 4,230 tons.

The excellence of the iron is unsurpassed. One of the most significant facts in connection with its use, is that though there have been many causalties by the explosion of boilers on the southern and western waters, yet no boiler made of Tennessee cold bast charcoal iron has ever exploded. It may also be mentioned that prior to 1825, all the sugar kettles used in Tennesssee, were made in Scotland. The impression was that Scotch iron alone could withstand the expansion and contraction to which sugar kettles are so frequently subjected during the boiling season. This error was dispelled by the Messrs. Stacker, who supplied the sugar planters with kettles, not only equal to the Scottish kettle, but so superior to it, as to drive the latter from the market. The Franklin Institute of Philadelphia, as early as 1832, after a comparison and test of the Tennessee iron, pronounced it equal to the Swedish iron in ductility, toughness and strength.

Now, as to the cost of working this charcoal iron, there is a great diversity of opinion, even among those engaged in its manufacture. We have taken special pains to collect facts bearing upon this subject. The books of the superintendents and the settlements made by them with the owners, have been taken as the highest evidence, simply because it would be highly improbable for a superintendent to fail to charge his company with all the expenses incurred in running the furnace.

The following is a *bona fide* transcript from the books of a company that is extensively engaged in the manufacture of this metal. It is for the year 1871—the furnace not running through the whole period of 1872 or 1873:

Operations —— Furnace for the Year 1871.

Number cords of wood chopped	16,176
Bushels of charcoal used	643,400
Number tons of iron made	4,110
Number of days blowing	296
Average tons per day for 296 days	13 6-7
Number tons of ore received	10,905
Average cost of ore per ton	$2.00
Number tons of ore to ton of pig-iron	2½

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Number bushels of coal used	639,400
Number bushels of coal to ton of pig-iron	155½
Average cost of coal per bushel	7¾c
Number pounds of limestone to ton of pig-iron	612
Cost of limestone to ton	50c
Whole amount of daily labor and salaries for the year	$26,469.49
Average cost of ton of pig-iron for labor and salaries	6.44
Extra per ton for hearths, sand, interest, etc	1.33

From this statement it is easy to sum up the cost of a ton of pig-iron, thus:

155 bushels of coal, at 7¾ cents	$12 04
2½ tons of ore, at $2	4 66
Labor and salary	6 44
Lime	50
Incidentals, interest, etc	1 33
Cost of ton charcoal [hot-blast] iron	$24 97

Substantially the same cost appears on the books for 1872 and 1873.

At Napier's furnace in 1873, the cost of making iron according to the superintendent's books, was twenty-four dollars per ton, but it was thought that this could be considerably reduced by having full stocks and running a ten months blast. Wood-choppers were paid from sixty to seventy-five cents per cord, and day laborers one-dollar and fifty cents per day, the laborers themselves supplying their own rations. The furnace is cold-blast and uses about 200 bushels of charcoal to the ton of pig metal. Seven dollars a ton was paid for wagoning it to Columbia, the nearest railroad station, a distance of thirty-three miles. The iron made was choice car wheel.

At Wayne furnace, which uses hot-blast, 150 bushels of charcoal, at six cents per bushel, are used for making a ton of iron. The cost of green ore delivered, is two dollars per ton; lime-stone, fifty cents; labor, salaries, repairs, etc., bring the cost up to twenty-one dollars and ninety-seven cents per ton. It costs four dollars to haul iron to Clifton on the Tennessee river, and three dollars and sixty-two cents from that point to Cincinnati, making the entire cost in the latter place twenty-nine dollars and fifty-nine cents. The labor is paid in goods, upon which fifty per cent. is realized.

Brownsport furnace, hot blast, in Decatur county, has a daily capacity of twenty tons. The ore is dug within one hundred yards of the trundle head. For making a ton of iron 120 bushels of charcoal are used (2,688 cubic inches to the bushel). Coal costs seven and a half cents per bushel delivered. Ore delivered, costs two dollars per ton. About two and a quarter tons of ore make a ton of iron. The hauling of the pig iron to the river costs one dollar and twenty-five cents per ton. Limestone is delivered at one dollar per ton.

In Stewart county, charcoal costs from seven to eight cents per bushel; ore delivered, from two to two dollars and fifty cents per ton; amount of charcoal used for hot-blast, from 140 to 150 bushels; for cold-blast, 170 bushels. Labor is cheap, most of the work is done by the job or task. The ores yield from the furnace, from forty to fifty-five per cent.

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The details, as given from a cold-blast charcoal furnace, in this county, for 1873, are:

170 bushels charcoal at 8 cents	$13 60
2 tons ore, at $2.50	5 00
Labor and salary	6 44
Lime	50
Incidentals	1 33
Cost of ton charcoal [cold-blast]	$26 87

The following analysis made by J. Blodgett Britton, of Philadelphia, will show the general character and richness of the ores of this county:

Water	9.10
Insoluble Silica	1.40
Pure iron Sesqui-oxide	52.97
Oxygen with iron	23.41
Alumina	1.36
Lime	.40
Sulphur	03
Phosphorus	06
	99.34

Double Furnace Assay yielded 56.10 in reduced metal or cast iron. The reduction was complete, buttons flattened under the hammer, fracture ragged, color dark gray, rather close grained; iron soft, but tough, not natural.

If the number of days in the year in which the furnace is idle should be deducted, it would reduce the price of iron twenty per cent. per ton on the items of salaries and labor. The estimate is further reduced by the profits from goods supplied to hands. About three-fourths of the labor employed is paid in goods, upon which a profit of thirty-five to fifty per cent. is realized.

ADVANTAGES OF TENNESSEE FOR MAKING IRON.

1. *Cheapness of Ore.* As compared with Hanging Rock, Ohio, and other points north of the Ohio river, it is striking, as the following figures will show. They are made for the year 1871:

Cost of ore to ton of pig-iron in the Western Iron Belt	$4 66
Cost of ore in the Dyestone Belt	2 00
Cost of ore at Hanging Rock, Ohio	7 50
*Cost of ore at Pittsburg	12 67

2. *Cheapness of Fuel.* In the Western Iron Belt charcoal costs per bushel 7¾ cents; at Hanging Rock, 10 cents—making a difference in cost of ton iron of $3.50. Coke is one-third cheaper in Pittsburg than in Tennessee, but there is no reason why it may not become as cheap or cheaper in Tennessee than in Pennsylvania.

3. *Days of Blowing.* This is very marked, when the averages of the furnaces in the Western Iron Belt and those at Hanging Rock are

*NOTE. In 1873 the cost of ore at Pittsburg was $13.30, but was reduced in 1874 to about $8.00

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constrasted. Timber is so scarce in Ohio that it is difficult to lay in a sufficient stock of charcoal to get a blast to exceed 2,500 or 3,000 tons. In the Western Iron Region the timber is abundant and convenient, as also in the Eastern Iron Belt.

4. *Taxes on property are lower.* In Tennessee, the amount paid for taxes on a furnace that will make 5,000 tons annually, is known to be $450. In Ohio, a furnace with the same capacity pays $1,220 taxes.

DISADVANTAGES OF TENNESSEE.

1. *Want of Transportation.* This, in all the iron regions of the State, except those portions contiguous to the Tennessee and Cumberland rivers, is a great drawback to the iron interests. It takes seven dollars per ton to transport the pig iron from Napier's Furnace to the railroad, four dollars per ton to get it to Tennessee river from Wayne Furnace, and from two to three dollars from other furnaces not convenient to railroads or navigable rivers.

2. *Difference in price of labor.* Labor is twenty-five per cent. higher in Tennessee, and not so efficient, but it is generally paid for in goods, upon which a large profit is realized.

3. *Want of a home market.* This makes additional transportation necessary.

With all these drawbacks, Tennessee can still make charcoal iron from six to seven dollars cheaper than it can be made in Ohio, Indiana or Pennsylvania, and stone-coal iron from four to five dollars less cost per ton. If coke were as cheap it could be made from ten to twelve dollars less.

The subjoined tables will show the cost of making iron in Pennsylvania, for the years 1850 to 1873 inclusive. The first table gives the cost of iron (stone-coal, hot blast,) on the furnace bank per ton of 2,240 pounds, as follows:

YEARS.	PRICE PER TON.	YEARS.	BRICE PER TON.	YEARS.	PRICE PER TON.
1850	$14 25	1858	$17 73	1866	$27 88
1851	13 30	1859	16 14	1867	27 88
1852	14 34	1860	16 85	1868	26 00
1853	14 38	1861	16 61	1869	26 83
1854	16 00	1862	16 11	1870	30 04
1855	18 87	1863	16 53	1871	29 65
1856	18 05	1864	20 97	1872	30 58
1857	17 04	1865	32 21	1873	32 33

The second embraces the several items of which these sums are made up, and the progressive increase in the price of each. We give these at several periods, before and after the war:

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COST OF	1850	1855	1860	1864	1866	1869	1871	1873
Ore	$ 5 75	$ 7 51	$ 7 45	$ 9 12	$12 19	$11 86	$12 67	$13 30
Coal	3 70	4 63	3 49	5 41	7 55	7 41	8 59	7 15
Limestone	93	1 26	1 21	1 93	2 65	2 14	2 08	1 97
Labor	2 22	2 85	1 87	2 85	3 46	3 46	3 54	3 79
Interest, etc	1 68	2 62	2 83	1 66	2 03	1 96	2 77	2 76

It may be well here to point out the danger which threatens our western iron fields by the inattention or neglect of our law-makers. The timber supply, while abundant at present, is consumed at the rate of 6,000 acres annually. In the neighborhood of old furnaces it has been cut down for a distance of three or four miles, and used in the making of charcoal. Sprouts put up every year, but the annual fires which sweep over the old "coaling" with devasting fury destroy them. No new timber is taking the place of the old. Barren, sightless old fields, covered with broom-sedge, meet the eye on every hand. How to protect the young timber in the iron region is a question that should seriously engage the attention of our Legislature, for it will not be a question of iron ore in the future, but of timber. A due regard for the rights of posterity, if not for the present occupants of this region, should be manifested in the enactment of stringent laws against all persons guilty of wantonly setting the leaves on fire. Were the young timber protected, it would grow as fast as consumed. Estimating that 500 acres are used annually by each furnace with a capacity of twelve tons daily, twenty-five square miles, or 16,000 acres would support a furnace perpetually, on the supposition that the trees will grow in thirty years large enough to be used for coal. In some situations that have been protected by roads and streams from fires, the timber on the land has been cut down a second time after the lapse of twenty-five years from the first cutting. It is a crime against the material interests of the State, and destructive of one of the finest iron regions in America, to permit the custom of firing the woods to continue. It is a relic of barbarism inherited from savages, and should be stopped by the infliction of pains and penalties.

In the preparation of this article on iron much assistance has been derived directly from the State Geologist, Dr. Safford, under whose eye the proof-sheets have passed, and all the details collected, submitted and criticised. Nothing has been admitted but what we have abundant evidence to believe to be true.

Our aim and desire have been to tell the simple truth in relation to our coal, timber, and iron ore, and not to mislead or deceive any one, believing in the end that such deception would prove the very worst possible policy. We do not hesitate to say, after a thorough examination of all the facts, and after a candid comparison of these withthe facts obtained from other localities, that no portion of America seems to present greater advantages for the manufacture of all grades of iron

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than Tennessee. When new avenues of trade shall have been opened to her; when her population shall have been multiplied, and her home markets increased; when the spirit of energy, thrift, and enterprise shall have seized her people, Tennessee will become one of the great centers of iron manufacture of the western world, and will dispense to the nations of the earth the product which is alike the emblem and promoter of a benign and splendid civilization.

COPPER.

The copper region of Tennessee lies in Polk county, in the south-east corner of the State. It is in an elevated mountain basin, not less than 2,000 feet above the sea, and 1,000 feet above the great Valley of East Tennessee. This basin contains about forty square miles. On the south-west, at a distance of a few miles, looms up the the dome-like crest of Frog Mountain, and from this, trending north-easterly, is one of the ranges of the Unakas. Towards the east and south-east are the towering peaks of the North Carolina chain, while southward, running into Georgia, the scenery is more subdued. The surface of this valley is made up of hills and ridges, with gneissoid rocks and metamorphic slates showing themselves here and there, the area presenting a wild and rugged character. To add to this wildness, the country is denuded of timber, much of it having been consumed in the making of charcoal, and large quantities have been destroyed by the fumes from the smelting furnaces, which, charged with sulphurous acid, wither and deaden all vegetation by their poisonous contact.

Through the southern part of the mining district flows the Ocoee River, which, rising among the ridges of Georgia, takes a north-westerly course gently and quietly through the copper valley, as if gathering its force for the fearful plunges through the deep gorges and narrow ravines of the Unaka Range. For twelve or fifteen miles after passing the copper valley, the confined stream, fretted with huge masses of stone, is white with roaring cascades and plaited currents, while, rising almost perpendicularly above, are frowning and winding cliffs, walling in the river, and forming altogether one of the wildest and one of the most romantic scenes in the south. Along this stream, and near the water's edge, a wagon road has been cut out of the cliffs, and forms the only means of transportation from the mines to the rail-road.

The copper valley is intersected by numerous small tributaries of the Ocoee, which cut deep ravines, between which are the rounded gneissoid hills before referred to. The strata dip at high angles to the south-east, and their outcrops have a north-easterly and south-westerly

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direction. The ore deposits are in lenticular masses or belts, lying in the valley, these belts being separated by intervening rocks. Though the walls of the ore are often not well defined, the ore blending and gradually disappearing with the containing rocks, the veins or belts of ore are plainly marked. The deposits are in three belts. From the outcrop downwards, four distinct zones or stories are passed through. These several zones are thus described in a report made by the Union Consolidated Company, in 1866:

"1. Upper part of the 'vein,' consisting of 'gossan,' i. e. sandy, porous, massive, or reniform ore, mixed with streaks of reddish-brown slate. In this zone, and especially in its lower portion, occur malachite, azurite, cuprite, in grains, masses, and threads, and native copper in foliated and dendritic forms. Cuprite (the red oxyd of copper), and the so-called black oxyd, become more and more abundant, and gradually form

"2. The second zone, the transition to which occupies, generally, not more than ten feet on the dip of the vein. This may be called the zone of the black copper ores. It branches upward, somewhat into the gossan. It varies in depth from two to eight feet, and appears to follow with its upper limit the contour of the surface above. In it are found layers, nodules, and pockets of cuprite, and granular admixtures of iron and copper pyrites. This division is abruptly cut off below by

"3. The third zone—that of iron pyrites and pyrrhotite (magnetic pyrites), containing but little disseminated copper pyrites, and, on the other hand, a large proportion of tremolite and actinolite of radial, fibrous structure, and wine-yellow to brown color. The disseminated copper pyrites grows more abundant in depth until it forms

"4. The fourth zone—that of copper pyrites. In the center of the deposit this mineral is almost pure and solid, containing some thirty per cent. of copper. Towards the walls, where it is mixed with pyrrhotite, iron pyrites, tremolite, and actinolite, the average contents of copper in the whole mass is 8-10 per cent."

The third and fourth zones above are hardly distinguishable, and may be thrown together.

The "gossan" spoken of is limonite iron ore, which caps the top of all the veins, but owing to its admixture with foreign ingredients, it makes a "red short" iron, almost or nearly worthless.

For a great while, the mining operations were confined to the black and red copper ores, but subsequently the yellow copper ores, of which the region is capable of furnishing large quantities, were smelted with satisfactory profits. The lodes of this ore vary greatly in richness, some of the ore containing six per cent. of copper, but much of it not more than two or three per cent. The low grade ores are crushed before smelting, and by a somewhat complicated chemical process the pure copper extracted.

There are now operating at Ducktown two large companies. The Union Consolidated Company, of Tennessee, and the Burra Burra

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Copper company. The Union Consolidated Company has the following mining properties:

The East Tennessee	480	acres.
" Mary's	160	"
" Isabella	240	"
" Callaway	320	"
" Maria	80	"
" McCoy	140	"
" Buena Vista	240	"
" Johnson	315	"
" Beaver	40	"
" Cherokee	320	"
" Ocoee	240	"
Total comprised in the original consolidation	2,565	"
Since acquired, mainly for timber	2,676	"
Making a total of	5,251	"

It employs in its operations two steam engines of eighty horse-power and four water wheels of sixty-nine horse-power. It has sixteen furnaces, and employs 562 men and eighty children and youths. The amount of wages paid is $200,000 annually. It consumed in its operations for 1872, 16,298 cords of wood, costing $48,-894. The production of ingot copper for the same year was 1,466,847 pounds, worth $308,038. The ores are mined from the company's own lands.

The Burra Burra Company has two steam engines, of eighty horse-power, and one waterwheel, of four horse-power. It ran nine furnaces in 1872, and employed one hundred and fifty-eight men and eight children, paying out for wages $60,000. It also consumed 10,192 cords of wood, costing $30,576, and produced, of ingot copper, 917,329 pounds, valued at $192,639. The ore is obtained from the lands owned by the company. The whole amount of copper made in the copper region is wagoned to Cleveland, a distance of forty miles, and shipped by the East Tennessee, Virginia and Georgia Railroad. The effect of the working of these mines upon the wealth of the county has been very great. In 1849 the total gross tax collected in the county, was $513.45, and the land was valued at $266,607. Ten years thereafter, in 1859, the county paid a tax of $4,539.67, and the land was valued at $2,240,420. In 1869, the revenue from that county amounted to $8,874.28. No part of the State shows a greater industrial activity than the neighborhood of Ducktown. The farmers have a ready market at home for all their supplies, at good prices, and a manifest improvement has taken place in the social and domestic life of the inhabitants. Churches and schools prevail, and educational advantages are highly appreciated and sought after.

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MARBLE.

The marble of Tennessee has gained, by its beautifully variegated appearance and fine polishing qualities, a richly deserved fame throughout the United States. There are found in the State several varieties, among which may be mentioned the black, grey, magnesian, fawn-colored, red variegated, conglomerate, and breccia. One or more of these varieties are met with in every division of the State. By marble, is meant any limestone that takes a good polish, and looks well after it is polished.

The black marble, sometimes beautifully streaked with veins of white calcite, is found in Washington, Greene, McMinn, Polk, Sevier, and, indeed, in many of the counties in East Tennessee, where the limestone has been fissured in local flexures. It is quite compact, having a great specific gravity, and takes a fine polish. This marble was used to form the bases of the columns in the senate chamber of the capitol at Nashville. That, with white articulated veins, would make handsome mantles.

The gray and red variegated marbles occur in inexhaustible quantities in several counties of East Tennessee. The two are usually associated, the one running into the other. The counties, however, which have furnished the largest supplies, are Knox and Hawkins. The gray, which is coralline, sparry, whitish, and often variegated with pink or reddish spots, rests usually upon a blue limestone. It weighs 180 pounds to the cubic foot, and is freer from "dries," or porous sponge-like cavities, or unconsolidated material, than that of deeper color. A quarry was opened in 1871, and is now worked, at the confluence of the French Broad and Holston rivers. This marble spreads over an area of many square miles, and is several hundred feet thick. It forms the building stone of the custom house in Knoxville, and the quality of it is justly regarded as among the finest in the State. A polished slab shines with glowing brilliancy, and the small pinkish spots that are sprinkled over its surface, give it a delicacy and richness of tint that is surpassingly beautiful. Unpolished, the pink spots do not appear. As employed in the custom house in "drove" work, it has a grayish white appearance, and is mistaken by many for the ordinary light-colored uncrystallized limestone.

No gunpowder is used in the quarry. The blocks are all separated by the use of the drill and forcing wedges. Thirty men are regularly employed at this place, and the force will be increased as the excellence of the marble becomes known. Already has a demand been created in St. Louis for it, and blocks are sold in that market at from three to six dollars per cubic foot, for mantles, moldings, &c.

Since the completion of the stone work of the custom house, a company has been organized with a sufficient capital to carry on the business successfully. The stone is sawed into slabs at the quarry by steam, and transported in flatboats, a distance of four miles to Knoxville, where it is shipped by railroad to various points. There are about

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eighty saws kept constantly at work. Two engines are employed; one for sawing, and the other for derrick work. Boats are brought up within ten feet of the saws, and very little labor is required to transfer the slabs from the one to the other. The following are the prices at which the slabs are sold, delivered on the cars at Knoxville:

⅞ inch slabs, superficial,	$ 38	per foot.
1 inch slabs, superficial,	42	"
1¼ inch slabs, superficial,	53	"
1½ inch slabs, superficial,	64	"
2 inch slabs, superficial,	82	"
3 inch slabs, superficial,	1 10	"
4 inch slabs, superficial,	1 45	"
5 inch slabs, superficial,	1 80	"
6 inch slabs, superficial,	2 15	"
7 inch slabs, superficial,	2 50	"
8 inch slabs, superficial,	2 85	"

The above cut to size, ten per cent. added.

Rough blocks, 20 cubic feet and under,	$3 00	per foot
Rough blocks, from 20 to 40 cubic feet,	3 50	"
Rough blocks, from 40 to 60 cubic feet,	4 00	"
Rough blocks, from 60 to 80 cubic feet,	5 00	"
Rough blocks, from 80 to 100 cubic feet,	6 00	"
Monuments block sawed to size	6 50	"

All spires measured at base.

Marble taken from the quarries around Knoxville, and worked into tombstones, show no signs of crumbling after exposure to the weather for fifty years.

A large quarry has been opened on the farm of Rolfe S. Saunders, seven miles north-east of Knoxville, on the banks of the Holston River, and near the East Tennessee, Virginia and Georgia Railroad. Mention of this quarry was made by Judge Haywood, in his History of Tennessee. It forms a perpendicular bluff over one hundred feet above the water's edge, several hundred yards in width and many miles in length. A few miles west, the same varieties appear on the farm of Horace Foster.

Col. John Williams, near the city of Knoxville, has a valuable quarry of this same gray variety. The bed at this point is 380 feet in thickness, and divided into three distinct layers. Commencing at the bottom and ascending, there is

1. Variegated with grey and red, with a slight flesh-colored appearance	55 feet.
2. Grayish white, slightly tinted, though not perceptible in an unpolished state	95 feet.
3. Redder, especially near the surface	230 feet.

The second portion of this section furnishes the most valuable marble. It is said to have no superior in the State as a building stone.

Two miles north of Knoxville, and near the East Tennessee and Virginia Railroad, is the quarry from which most of the marble used in the State capitol, at Nashville, was taken. It is known as Sloan's Quarry. This marble is more highly variegated than that taken from the quarry at the mouth of the French Broad. It has a deeper red, and is of such rare and exquisite beauty as to arrest the attention of

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the most unobservant. It was used in the State capitol of Ohio for ornamental work. The quarry was opened in 1852, and this, with the one in Hawkins county, has given character to that peculiar species of marble known as East Tennessee marble.

A short distance east of Athens, in McMinn county, is a fine bed of grayish marble. It bears a high polish, and is gretaly esteemed for its beauty.

But the Hawkins County Marble is the best known, both on account of the length of time it has been worked, and because it was in that county that the general Government opened a quarry for the ornamentation of the capitol at Washington. This marble is highly variegated, and differs from that taken from Sloan's Quarry, only in being more delicately shaded, and not being of such a deep reddish tint. The history of the opening and working of the marble quarries in Hawkins county is thus detailed by Dr. Safford in his Geological report:

"In April, 1838, the 'Rogersville Marble Company' was formed, by gentlemen in and near Rogersville, for the purpose of 'sawing marble, and establishing a marble factory in the vicinity of Rogersville.' Orville Rice, Esq., was elected President, and S. D. Mitchell, Secretary. The company operated to a limited extent for several years, erected a mill, and sold several thousand dollars' worth of marble annually, which was mostly distributed in Tennessee.

"In 1844 the company sold out to Mr. Rice, who, on a moderate scale, has perseveringly and successfully carried on the business ever since.

"Mr. Rice sent a block of the 'light mottled strawberry variety' to the Washington monument. This was called the '*Hawkins County Block*,' and bears the inscription, '*From Hawkins County, Tennessee.*' Another block of one of the best varieties, was sent by act of the Legislature, which was called the '*State Block.*'

"These blocks attracted the attention of the building committee of the national capitol, who, although they had numerous specimens from all parts of the Union before them, decided in favor of the East Tennessee marble.

"An agent was soon after sent by them to ascertain whether or not it could be obtained in quantity, who, when on the ground, had no difficulty in satisfying himself as to that point.

"As the result of these circumstances, an extensive quarry, affording an excellent material, was opened at a point about nine miles southwest of Rogersville, where the Holston River intersects the marble range. The rock here is, in good part, massive, and several hundred feet in width. The location of the quarry is excellent, and admits of the easy transportation of the blocks to the boats. Many thousand cubic feet of marble were sent off. It was taken down the river, and then by railroad to Charleston or Savannah, where it was shipped for Washington.

"A good use has been made of this marble in the capitol at Wash-

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ington. The balustrades and columns of the stairs leading up to the House and Senate galleries, the walls of the Marble Room, and other parts of the building, are of Tennessee marble. It doubtless forms half the ornamental marble there."

This marble is also used in the money-room of the treasury building in Washington, and it shows its superior beauty when contrasted, as it is, with the marbles from other States.

The marble in Hawkins county lies west and south-west of Rogersville. It is found on the south-west side of a bench of Trenton and Nashville limestones, and runs for a distance of sixteen or seventeen miles. In thickness, it varies from fifty to several hundred feet. The quarry which the Government opened lies on the Holston River, near the south-west end of this belt.

There are quarries of this same marble near Loudon, in Loudon county, and also near Sweetwater.

The variegated red marble is also found in many of the counties west of the Cumberland Table-land. One, of a brownish red, is met with on the waters of Elk River, in Franklin county, in considerable quantities; the gray is also found in the same county; both have been worked to some extent. A gray marble, crinoidal in structure and dotted with red, also occurs in Maury county, at the Oil Spring on Lieper's Creek. Some of the marble at this place has a ground work of gray, with fleecy clouds of red and green. It is susceptible of a high polish, and would make handsome mantles, table tops, and pannel work. The bed is ten feet in thickness, and extends for a considerable distance.

An extensive bed occurs on Elk River, and some of the tributaries of Elk in Lincoln county, specimens of which exhibit all the characteristic beauty of the red variegated East Tennessee marble. Quarries in that county are now worked to some extent.

In Henry county, a mile or two from Mammoth Springs, on Big Sandy, and four miles from Springville Station, on the Memphis and Louisville Railroad, is a bed of red marble, mottled, and susceptible of a very high polish. It is similar in character to the East Tennessee marble, and has been used for monuments, tombstones, etc. It is a handsome variety and greatly admired.

On Birdsong Creek, in Benton county, there is also marble of similar character. It is inexhaustible in quantity, and has been quarried to a considerable extent. These beds in Henry and Benton counties are best known as supplying material for lime, they being the last outcrops of limestone in the State going west.

In the Western Valley of the Tennessee, there are also other beds of red marble. The finest presentation is probably in the counties of Perry, Decatur, Wayne and Hardin. Much of it lies immediately upon the Tennessee River. Near Clifton is an extensive bed. The piers of the bridge at Danville, where the Memphis, Louisville and Great Southern Railroad crosses the Tennessee River, are built of grayish marble from Decatur county, found ten miles below Perryville.

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The thickness of the stratum is ten feet; it is inferior in beauty and fineness, but not in solidity, to the Hawkins county marble.

On Shoal Creek, in Lawrence county, eighteen miles south of Lawrenceburg, and extending on both sides of the creek for a distance of fifteen miles, is a bed forty feet in thickness, of fawn-colored or brownish red marble, with fleecy clouds of green. It bears a very fine polish, and is beautiful in the delicateness and softness of its coloring. Other strata, in the same locality, are of an intermingling red, green and white colors. Some of it, with a brownish ground, is covered with deep red spots, which shade away until the ruddiness is lost in the common ground. It is free from "dries," very solid and compact, and is pronounced by competent judges to be as valuable as any in the State. But for lack of railroad conveniences, it would soon attract the attention which its delicate beauty would warrant. Farmers build chimneys of it, and a furnace-stack built in 1833, by Mr. Vanleer, of the same material, is still standing in an undamaged condition.

A short distance below Manchester, a bluish or dove-colored marble appears in considerable abundance, forming the bed of Bark Camp Fork of Duck River. The late Dr. Troost expressed a high admiration for its subdued beauty and its fine quality. In Wilson, Davidson and other counties, a dove-colored marble is met with, which is worked up into grave-stones and for other purposes.

In Rutherford county, a bed of marble occurs of a pale yellowish color, with serpentine veins of red and dots of black. This bed has not been traced, and specimens have only been polished for paper weights and objects of curiosity. It bears a fine polish, but is not so handsome as some other varieties.

There is also in the southern part of the East Tennessee Valley, and especially in that portion east of the Holston, a light gray, fine-grained rock, variegated with brownish red clouds, which is worked as a marble, though its appearance is greatly inferior to those mentioned above. It is known as magnesian marble. Some of it does not weather well, being reduced by exposure to shaly material. Some of the best occurs near Chattanooga.

The Breccia limestones on the Little Tennessee River, south of Chilhowee Mountain, sometimes supply a beautiful marble. The angular fragments, which make up the rock, are often of different colors, and when polished present a surface of checkered and varied beauty, resembling mosaic work. This marble occurs in Greene, Cocke and Sevier. It is not much worked on account of the hardness of some of the angular fragments.

The conglomerate marble, differing from the last only in the shape or configuration of the imbedded gravel, being in this rounded and not angular, is found in the same region. It has the same style of beauty when polished, as that last mentioned.

Doubtless there are many other places in which marble has been found, but the great abundance of it in every part of the State makes

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it an object of but little interest, unless it has some superiority in the elegance or beauty of its appearance.

ROOFING SLATES.—There are, in what is known as the Ocoee group, strata of pale, greenish slate, semi-talcose, and free from pyrites. This slate splits easily into thin plates with smooth surfaces, and though never having been used for such, would doubtless be valuable for roofing purposes. It is met with in Polk, McMinn, Monroe, Sevier, Blount and Cocke counties. Slates of various shades might be quarried in different localities in these counties—light and dark green, dark purple, reddish and violet.

MILLSTONE GRIT.—Several beds of Millstone grit have been found in the State. Perhaps the most noteworthy is that in Claiborne county, at Big Spring, on the road leading from Morristown to Tazewell. The rock is a flinty mass, filled with cellular cavities. The manufacture of millstones at this point was carried on as a business before the war, and the demand for them increased as their excellence became known. Many millers regarded them as equal in every particular to the French buhr. The hard gnessoid rock near Taylorsville, in Johnson county, has been used for millstones. Those made of this rock are inferior to the last mentioned, and are unsuited for the grinding of wheat, though they answer tolerably well for corn. The syenetic granite in Carter county is more highly esteemed for grinding both wheat and corn. The conglomerates of the Coal Measures, made up of hard, flinty material, honey-combed in structure, have frequently been wrought into millstones. In Trousdale county, a few miles north of Hartsville, is a stratum of silicified shells several feet in thickness, that has been used for the same purpose. This mass, when exposed to the disintegrating influences of the weather, is leached of its calcareous matter, leaving it filled with innumerable small cavities. It was formerly extensively manufactured into millstones. Some of them have been used for forty years and are still preferred to new ones for the grinding of corn. This quarry belongs to the upper part of the Nashville formation, is quite extensive, and might be made very valuable if worked.

Near Manchester, in Coffee county, a conglomerate is met with that answers a very good purpose for millstones. Some of it has all the characteristics of the true buhrstone, being hard, gritty, and consisting of siliceous pebbles that have been cemented into a flinty mass. Wherever exposed, it has a cellular structure. The same stone appears in Lewis, Macon and other counties, and indeed in many localities in the sub-carboniferous formations.

HYDRAULIC ROCKS. These rocks abound in many counties in the State, and more especially in Hardin, Wayne, Perry, Decatur, Warren, and Montgomery, and in many of the counties of East Tennessee, especially in Knox and McMinn. Mills for grinding the stone after burning were in operation in Hardin, Montgomery, Warren and Knox before the war. The quality of the cement is excellent. Arrangements for manufacturing it on an extensive scale in Hardin county,

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above Clifton, had been perfected before the war, and the cement bore well all the tests to which it was subjected.

Dr. Safford says of it:

"The cement manufactured is of lighter color than the Louisville article, and of good quality. In 1861, Mr. Pillow sent me a barrel, of that first manufactured, for trial. The barrel was put away in my cellar, and, owing to the troubles which soon came upon us, was left there without being opened. In the meantime, during a very rainy season, water rose in the cellar, and the cement got thoroughly wet, It soon hardened, the hoops and staves fell away, and the cement was left in a solid cylindrical mass—a good cast of the barrel which held it. I have also seen, in the Tennessee river, barrel-shaped masses of the hardened cement, from lots originally lost by the sinking of steamboats."

Mr. Saulpaw, a practical mason, who has taken many large contracts for the building of bridge piers, says it is the best cement in the United States.

In Knox county, cement is made of the brown calcareous shale, which is found to be a good material for this purpose. The value of this shale for the making of cement was first discovered by Mr. Estabrook, a man of sagacity, energy and public spirit.

The quantity of material in the State from which hydraulic cement may be made, and its accessibility to market, together with the constant and increasing demand for this article, will doubtless attract attention to this unoccupied field of industry. Tennessee could supply the whole southern market with cement at cheaper rates than any other state. It speaks badly for the enterprise of its citizens, that while thousands of barrels are every year used in building cisterns, and in underground stone or brick work, nine-tenths of it should be brought from neighboring states, although the material in the State suitable for its manufacture is inexhaustible in quantity, superior in quality, and accessible to market.

Building Stone other than Marble. In every portion of the State, except in the Teritary and Quarternary formations of West Tennessee, building stone is convenient and plentiful; though differing widely in its weathering capacity, color and structure, every neighborhood, and oftentimes every farm, has its quarry. The rock most used for building purposes is limestone, on account of its prevalence, compactness and good workable qualities, though the marbles, sandstones and granites are brought into requisition for the same purposes, where they are abundant and convenient.

The limestones differ greatly in their color and durability. Some strata are laminated, others compact; some are oolitic, consisting of minute concretionary spherules, resembling the roe of fish, others granular and crystalline. Many of them make valuable building material, while others crumble down or exfoliate by exposure. Some have impurities, as magnesia, sand, clay; others are almost pure carbonate of lime. Most of the limestones have been formed from shells

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and corals, ground up by disintegrating agencies, and afterwards consolidated. When these shells or corals are found comparatively unbroken in the structure of the limestone, it is not so compact or homogeneous, and will not resist in the same degree the erosive action of frosts or rains.

The State capitol is built of a laminated limestone, that shows its sedimentary character in the numerous horizontal bands arranged in laminæ. It is, in reality, a consolidated bed of calcareous sand. It has a bluish gray color, streaked with lines more or less dark. In the round columns, they appear as lines or bands.

A most beautiful limestone for building, forms one of the ridges in Houston county, a short distance from Arlington, the county seat. It is compact and massive, and lies in huge blocks, with vertical seams. The stratum must be at least fifty feet in thickness. When dressed, it has a creamy or subdued whitish color, with sparkling, crystalline particles. When first quarried, it works with ease, but hardens by time. It stands weathering, and is almost destitute of fossil remains. It is much used in Memphis as capstones, and brings, in that market, a high price.

Dove-colored limestones are found all over the Central Basin. Their neutral color makes them a favorite stone for the foundation of dwelling-houses.

Four miles south-west of Nashville, occurs a bed of light-colored limestone, good grain, easily worked, and very durable. It forms some of the most magnificent fronts to the store-houses and other buildings in Nashville. The stratum is four or more feet in thickness, and is known as the Bosley stone.

A rock very much of the same character is found in Bell's Bend, probably the same stratum as that mentioned above, which has been extensively used, and some of it, several years ago, was taken to Memphis. The owners have made extensive preparations for quarrying this stone, a railroad having been built to convey it to the Cumberland river. The oolitic limestone of the Cumberland Table-land is an excellent building stone, on account of its light color, grain and durability. It occurs on the slopes of the Table-land. A light-colored sandstone, from the top of this Table-land, has been used for building purposes. It is compact, hard and durable. One front in Nashville has been constrncted of it.

There are localities where a soft sandstone occurs, especially in the counties of Dickson, Lawrence, Wayne, Perry, and Hickman, This rock is much used for building chimneys.. When first quarried it is soft, easily cut with an axe into desirable shapes, but hardens by exposure.

A fine mottled red sandstone suitable for building, occurs in Anderson county.

In East Tennessee, near the North Carolina line, are places that would supply a good granite for building; both gray and reddish varieties occur, the latter somewhat resembling the Scotch granite.

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In the Central Basin, the surface, glady limestones, as well as the better rocks from quarries, are utilized in the building of fences. All the best farms of Davidson, Maury and Rutherford counties have more or less stone fencing. Many of them have no other for outside boundaries. The prevalence of this limestone rock in Middle and East Tennessee renders the farmers, in a measure, independent of the timber supply for enclosures. Flagstones for pavements can be obtained in several localities in the Central Basin. Much of the iron limestones are in thin sheets, ripplemarked, and answer a good purpose for flagstones. This has, to some extent, been used for curbing and paving in Knoxville and other towns in East Tennessee. Flags of sandstones occur in Morgan and Anderson counties. Roofing slates are also used for flags.

A red ferruginous sandstone, occuring in isolated masses on high points in West Tennessee, often in fantastic shapes, most usually in great cubic blocks, is much used in that region as foundations for buildings. It belongs to the Orange Sand formation, and supplies a want in that division of the State, owing to the scarcity of building stone. A curious specimen of this sandstone occurs at Hollow Rock Station, on the St. Louis division of the Nashville, Chattanooga & St. Louis Railway. It is a huge boulder, and is pierced by a large cavity.

POTTER'S CLAY. This clay results from the decomposition of granites and shales. When the clay is red or yellow, it denotes the presence of the oxide of iron; when white, its absence. Potter's clay has a peculiar unctious feel, and has the valuable property of resisting heat without cracking. Considerable deposits of white clay are found in East Tennessee, on the Knoxville and Ohio Railroad, and in the vicinity of the lower Tennessee river, in the counties of Hickman, Perry and Wayne; also in Montgomery and Houston counties. Some of this clay has been worked up into stone-ware. There are numerous establishments in the State for the manufacture of potter's ware, and quite large ones in Memphis, Nashville and Knoxville. The wares are sometimes colored with oxide of manganese. Kaolin, a clay derived directly from granite, is found in Carter county. Beds of fine white clay are numerous in East Tennessee, and generally, if not always, accompany the weathered outcrops of Knox limestone.

FIRE CLAY. A useful variety is met with in Stewart county, at the heads of several of the smaller valleys. The Memphis and Louisville Railroad also cuts through extensive beds in Houston county. Upon the erection of the Cumberland Iron Works, on the Cumberland river, fire-bricks at an enormous expense were brought from Liverpool. In prospecting for iron ore, a bed of grayish-colored earth, underlying a bed of gravel, was found near the "Morgan Bank." This earth was tested, and the bricks made of it were found to be equal to those brought from Liverpool. This bed of clay has been worked to the depth of six feet without reaching the bottom. Much of it has been shipped to various points. Fire-clay is also found in the Coal Measures, always, we believe, immediately underlying a seam of coal. It

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results from the decomposition of the siliceo-argillaceous underlying shale, and its plasticity and impervious nature, when collected in a bed, prevents it from being carried away by infiltration.

GOLD. Hopes were entertained for many years that this precious metal would be found in paying quantities. The first gold was discovered in the State on Coca Creek, in Monroe county, in 1831. The discovery produced an intense excitement. The farmer left his plow, the woodman his axe, the hunter his gun, the shoemaker his last, and hurried to this newly found El Dorado. Over a space eight or ten miles long and two or three wide, the accumulations in low places and in the beds of streams, were "panned' with a commendable industry. But no very rich deposits were ever found. The highest average per day was about two dollars, and this average fell, until gold digging in Tennessee was abandoned as a profitless business. A company for the purpose of working the Coca Creek Mines has been formed since the war; what success it has met with we are not informed. The following table, taken from Safford's Geology, will show the amount of Tennessee gold that has been deposited in the United States Mint. It will be observed, that the largest quantity for any one year did not much exceed $7,000. The two most prosperous years were 1833 and 1848.

YEARS.	VALUE.	YEARS.	VALUE.	YEARS.	VALUE.
1831	$1,000	1839	$ 300	1847	$2,511
1832	1,000	1840	104	1848	7,161
1833	7,000	1841	1,212	1849	5,180
1834	3,000	1842		1850	1,507
1835	100	1843	2,788	1851	2,377
1836	300	1844	2,240	1852	750
1837		1845	3,202	1853	149
1838	1,500	1846	2,642	1854	
Total					$46,023

LEAD. Though this metal has been found in various localities in East and Middle Tennessee, no sufficient quantity has been met with, except at one place, to justify the erection of an establishment for its reduction. The veins or pockets have proved unreliable. Among the most promising veins is the Caldwell Mine in Union county. Besides this, are the Jackson Mines in Bompass Cove, Washington county, the Carter and Montgomery Mines in Monroe, and the Hambright Mine in Bradley. The Hambright Mine was first opened in 1851. The Confederate government worked it in 1861-2-3, employing 100 men, and spending $25,000 in erecting works. The lead is in pockets, each pocket yielding from a half ton to a ton. In regard to the Caldwell Mine, Dr. Safford, who visited it in 1867, says:

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"Of all that I have seen, there is but one that I regard as promising and that is the Caldwell Mine on Powell's river. This is in Union county, at a point on the river between Tazewell and Jacksboro', and about sixteen miles from the former place. The vein fills a nearly vertical fissure, about twenty inches wide, in nearly horizontal rocks. It can be traced for nearly a mile. At the time of my visit, very little had been done towards its development, but its character, in one place on the surface, could be distinctly seen. The galenite, associated with blende and some pyrite, occurs in several sheets, with an aggregate thickness of about five inches. The sheets are separated by a gray vein-stone. There is reason to believe that the character of the lode will improve further down."

South of Tazewell, in Claiborne county, a vein of lead ore crosses the road leading from Morristown to Cumberland Gap, and has been traced for several miles. Large specimens have been picked up, but no abundance has been developed. The assays of the best lead ores, (*galenite or sulphuret of lead,*) show that in 100 parts there is of

Lead	86.6
Sulphur	13.4
	100.0

Zinc Ores. There are two ores of zinc easily worked, the smithsonite and calamine. These occur at a number of localities in considerable deposits, especially in Claiborne, Union, and Jefferson counties.

A large establishment for the manufacture of white oxide of zinc for paint, was once in operation at Mossy Creek, in Jefferson county. Since the war it has been suffered to go to decay, although it is understood that the lack of ore, in workable quantities, was not the cause of its failure.

The zinc ores are probably in greatest abundance in Union county. Near Powell's river, the Stiner belt of zinc exists. It is fifty or sixty feet wide, and is marked by the absence of trees. Dr. Safford, who traced the vein in 1865, for a considerable distance, in an east-north-easterly direction, says, that at the time of his visit, six or seven pits had been dug and a large quantity of ore thrown out. Some of this was taken down the river, but the most of it has been lying on the ground ever since. So far as could be seen, the ore, smithsonite and calamine, occurs, with here and there buttons and small masses of galenite, and occasionally of blende, with much siliceous matter, in irregular "veins," or in a network of veins. The veins apparently run vertically into the rocks, are from a few inches to several feet in thickness, and with the enclosed matter make up the zone described. The rocks of the vicinity are dark and blue magnesian limestones, of the lower part of Knox Dolomite. Some of them are oolitic, and a few thin beds of Knox variegated shale are met with. The strata, in general, are approximately horizontal. The masses of ore thrown out are rough, heavy, and generally more or less open.

The lead and zinc ores are often associated, and with proper means

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of transportation, the working of the latter, no doubt, would prove remunerative, and add to our mining industry.

Of the zinc ores, smithsonite (*carbonate of zinc,*) contains

Oxide of zinc	64.8
Carbonic acid	35.2
	100.0

Calamine, or *silicate of zinc*, has

Oxide of zinc	67.5
Silica	25.0
Water	7.5
	100.0

Zinc blende, (*sphalerite or sulphuret of zinc*) and cerussite, (*carbonate of lead*) occur at many of the localities mentioned above, but they are of limited importance. They are only mentioned as showing the great variety of our mineral deposits.

Black Oxide of Manganese. This ore is nearly associated with iron, especially in the banks of the eastern and western iron regions. Though valuable in many of the arts, it has been used only to a limited extent in Tennessee. Small quantities are mixed with the iron ores in Greene county, which serve to fit the iron for making Bessamer steel. This mineral is distinguishable from iron ore by the earthy black color of its powder. It sometimes resembles magnetic iron ore, but differs from it in not being attractable by the magnet. Like iron, it is found in small masses all over the State.

Iron Pyrites. This mineral also exists everywhere in the State, and inasmuch as it has a yellow color and metallic lustre, it often excites hopes of boundless wealth. Scarcely a week passes that the State Geologist does not receive a package of the mineral from persons who believe they have discovered gold beds of marvelous promise. It is valueless unless when occurring in large quantities, when it may be utilized in the manufacture of sulphur and suphuric acid. It can be distinguished from gold in several ways.

1. By its hardness. It strikes fire with steel as readily as flint, and from this circumstance it derives its name—pyrites meaning fire-stone. Gold, on the contrary, is soft and easily cut, and of course will not strike fire with anything.

2. It makes a *black* mark on a piece of unglazed porcelain, or on the clean surface of a whetstone, while gold always gives a golden yellow metallic streak.

3. If coarsely pulverized and roasted on a shovel to a low red heat, it takes fire and burns, giving off the fumes of burning sulphur, while gold, under the same conditions, would remain unaffected.

We have been induced to give these tests in order that persons may apply the tests themselves.

A large quantity of this mineral is found associated with the copper at Ducktown. It also occurs in a considerable bed in Greene county,

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two miles south of Greeneville; in Moore and Perry, and indeed everywhere in the Black Shale formation.

COPPERAS.—The mineral which has just been described, when it occurs mixed with shales, very often in sheltered places, decomposes in such a way as to give incrustations or deposits of impure copperas. The black shale, which crops out on the margin of the Highland Rim, is capped by siliceous, flinty layers. Exposure to the atmosphere disintegrates the shales, and leaves circular, cavernous spaces, often called "rock houses," with great overhanging rocky ceilings. Sometimes these are called copperas caves. There are hundreds of these rock houses, in which it is common to meet with heaps and specimens of copperas. This crude copperas is used for domestic purposes, such as dyeing, etc., by persons living in the vicinity.

During the conflict between the States, tons of copperas were made from the *debris* thrown out from the copper mines at Ducktown, this *debris* consisting in great part of iron pyrites.

The manufacture of copperas could be carried on to considerable extent in Tennessee, but the low price of that article presents very few inducements at present to engage in its manufacture.

HEAVY SPAR OR BARYTES.—A white, heavy mineral used for making cheap paints, and takes the place of white lead to some extent. It is found in Middle and East Tennessee. It is mined in Greene, Washington, Jefferson, and some other counties. It is found usually associated with lead, constituting the gangue of that mineral. It occurs in all the limestone counties of the State, but rarely in workable quantities.

In 1840, while Col. R. C. Morris was prospecting for lead in McMinn county, he discovered an extensive bed of it near the mouth of Mouse Creek, on the west side of the point of the ridge running down between Hiwassee River and the creek, opposite the point from where the lead mine was opened. He penetrated the bed for twenty feet. The deposit is very rich and heavy. The following are the shipments from the several stations on the East Tennessee, Virginia, and Georgia Railroad for the year ending June 30, 1873:

Fullen's	455,663	pounds.
Greeneville	125,498	"
Midway	184,847	"
Morristown	197,835	"
Sweetwater	76,334	"
Total	1,040,177	"

GYPSUM.—An extensive bed of gypsum would be very desirable as furnishing material for land-plaster, and it has been industriously sought for, but as yet no such happy discovery has been made. Nevertheless, gypsum, in cabinet specimens, has been gathered in many points, both in East and Middle Tennessee. Small crystals have been observed in great quantities in the soils east of Bays Mountain; in many of the lead veins, and in iron pots or gnodes of iron ore of the Western Iron region. It takes the form of dazzling incrustations in

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numerous caves, which often assume the form of snow rosettes and icy vegetation. The most noted of these caves is Gray's Cave, in the northern part of Sumner county. On the floor of this cavern are fine specimens of crystalized gypsum or selenite. Some of the limestone rocks of the Cumberland Table-land are loaded with balls of granular gypsum, a true alabaster. Many of these balls are four or five inches in diameter, or even larger.

COMMON SALT.—Twenty-five or thirty years ago, salt, to some extent, was made in the State, especially in Overton, White, and Anderson counties. The wells, however, failed to hold out, or the water became too weak to justify further operations, in the face of the competition from other quarters. Perhaps the most important locality is at Winter's Gap, in Anderson county, where salt was manufactured for many years. A diagram showing the relative position of this well is given in the article on coal, p. 107 During the petroleum excitement, many wells bored in search of that oil yielded salt water, from which a fair percentage of salt might have been manufactured. On Obey River, furnaces were erected and the manufacture of salt begun. The want of transportation probably caused an abandonment of the works. A number of artesian sulphur wells, among others those in Nashville, and in Henry and Hardin counties, were bored in search of brine. The manufacture of salt has not proved thus far a profitable industry.

SALTPETER OR NITRATE OF POTASH.—In 1812–14, a large amount of saltpeter was manufactured in this State, and small quantities during the late civil conflict. The nitrous earth is found in caves. These caves are numerous all over Middle and East Tennessee. They are found in limestone regions.

PETROLEUM has been found at various points in the State. In Overton county there are many places where this oil oozes from the surface. Spring Creek, in that county, has given the fairest promise of a remunerative return. Ten thousand barrels of oil have been obtained from the wells in that vicinity, but the price of transportation made the business unprofitable. On Eagle Creek, in the same county, oil was obtained. On Jones' Creek, in Dickson county, some oil has been found at various times, amounting in all probably to 200 barrels. The depth to which the boring was carried in Overton county was less than 100 feet. On Jones' Creek oil was found at the depth of 132 feet. Deeper borings failed to increase the yield.

LIGNITE.—This may be termed a half-formed coal, and is intermediate in character between the true coal and a mass of dead vegetable matter. In appearance it sometimes looks like the true coal, but it has rarely the deep lustrous black of that mineral. It is very often of a brown color, light and sometimes spongy. It does not ignite readily, or burn freely, though it is often used for fuel, burning when dry, something like rotten wood, and emitting an empyreumatic odor. In structure it varies considerably, sometimes showing woody fibre, and then approaching in aspect the mineral coal. For commercial purposes, its value increases as it approximates the latter in appearance.

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Sometimes it is scarcely distinguishable, except during combustion, when it emits the peculiar odor mentioned and burns with a smothered flame, leaving a large residuum. Extensive beds of lignite are found in many of the counties in West Tennessee, and especially in those counties in which are the escarpments that overlook the valley-plain of the Mississippi. Fair presentations are to be found in Dyer, Lauderdale, Tipton, and Shelby. The beds, sometimes overlying each other, vary in thickness from a few inches to four and five feet. A fine bed, four feet thick, is seen at Old River in Tipton county. At this place are three strata of lignite, with many more thin seams. These beds do not spread out laterally very far, but usually thin out and appear to have been formed from beds of accumulated vegetable matter, either the former growth of swamps, or of drifted material.

At Raleigh, the old county seat of Shelby county, situated on Wolf River, a mine was opened in the winter of 1855–6, and the lignite was used as fuel in a hotel at that place. It is said to have been a tolerably good substitute for coal, but in its burning and heating properties it was far inferior to that article. Attempts were made also to generate steam in a neighboring saw-mill with it, with not very satisfactory results. Blacksmiths have employed it in their forges when nothing better could be obtained. In very dry seasons, when set on fire, it will burn for weeks in the beds. The lignite, like peat, in order to be used as a fuel, must be mined in the summer or fall and suffered to dry thoroughly.

Some interesting adventures in reference to this article have occured, among others may be mentioned the formation of a joint stock company, a few years anterior to the war, for the purpose of mining coal near Old Fulton, in Lauderdale county. It was believed by the projectors of this company that a real coal mine existed, and great were the expectations created. Excitement ran high along the Mississippi river. The advice of eminent geologists was disregarded for the superior knowledge of "practical miners." Great preparations were made and considerable sums of money expended in getting out a huge pile, which, to the eyes of the "practical miners," was the representative of vast wealth. But this, like all other ill-advised schemes, proved illusory, and the company dissolved without finding a sale for their precious products.

In many other counties, in the digging of wells, lignite has been met with, and its black appearance when damp has given existence to rumors about the discovery of coal in West Tennessee. In Carter county, also, a limited bed of lignite has been met with, not far from Elizabethton. Into this bed pits were sunk and the mineral used for a short time.

We wish to say here, once for all, that no true coal has ever been discovered or is likely to be discovered in the State, except within the limits of the Cumberland Table-land, or its outliers, the thousand and one reports to the contrary notwithstanding. In this, as in many other particulars, the negative results of geological surveys have their value,

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inasmuch as they save immense expenditures of labor and capital in pursuit of chimerical enterprises. So far as Tennessee is concerned, the Coal Formation is distinctly defined, and outside of it true coal is not to be expected. Lignite also has its geological horizon, and belongs to much more recent formations, such as the Tertiary, and more modern deposits. In the future cycles of chemical change, embracing many ages, lignite may be transmuted into coal, but, as yet, it bears the same relation to that article that the sprout does to the old Irish oak, that lies imbedded in the peat-beds or morasses of the Emerald Isle.

Another ignis-fatuus that bewilders the unscientific mind and decoys many into the infatuations of delusive hope, is the black shale. Because this material is heavily saturated with an inflammable oil, and therefore ignites and burns, and because its structure is that of a shale or slate, it is thought to be an unerring indication of coal, if not coal itself. In hundreds of places in this State this shale has been dug into in search of coal, money and time wasted, and hopes blasted. If this report should effect no other good than that of deterring persons from engaging in such adventures and illusory speculations, it will have saved a great deal to the people of the State. For more than twenty years men of more than ordinary intelligence have been deceived by the black shale and lignite, and we have scarcely visited a county in which indications of coal are not reported—always hearing of it, but never seeing it, except in its proper geological position. These errors are akin to those spoken of under the head of iron pyrites.

ALUM. Alum is found in the same situations as copperas—in the "rock houses" of Middle Tennessee. The black shale could be profitably used in the manufacture of this salt. It also occurs in the sheltered places of the Unaka Mountains.

EPSOM SALTS. In limestone caves, the rocks of which contain magnesia, epsom salts are by no means a rare mineral. This material is also found in many of the salpeter caves. In some of these it was gathered by the barrel during the war. A noted locality for this salt is Alum Cave, in Sevier county.

BLUESTONE (*Sulphate of Copper.*) This is found at Ducktown in large quantities. Beautiful masses have been met with in the mines. The water flowing out of the drifts is impregnated with this salt. It is not, however, separated as sulphate of copper, but is converted into metallic copper by being brought into contact with iron. A great deal of copper is thus separated every year from this salt.

MINERAL WATERS. Tennessee may challenge comparison with any portion of the United States in the number, variety, excellence, and medicinal value of its mineral waters. They occur upon the lofty peaks of the Unakas, and break out in groups from the bases of the long ridges of the Eastern Valley. The Cumberland Table-land is crowned with sparkling chalybeate springs, and beautified by some of the loveliest scenery in America. The Highland Rim sends forth sulphurous and chalybeate springs too numerous to mention, and even

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West Tennessee, from Kentucky to Mississippi, pours forth great volumes of mineral waters from the deep strata that lie beneath the level surface.

There are many of these springs that have a reputation co-extensive with the Union, on account of their curative properties. It cannot be doubted that the pure air, magnificent scenery, cooling breezes, and other healthful influences, will make these watering places favorite summer resorts for all the states lying in a lower latitude. Especially do we refer to those places in East Tennessee and on the Cumberland Table-land, many of which are handsomely improved, and offer accommodations equal to the best. During the summer of 1873 they were crowded with persons fleeing from cholera, and the miasmata which infest lower districts. Swarms of visitors from Atlanta, Macon, Savannah, Charleston, New Orleans, Mobile, as well as from Memphis, Nashville and Chattanooga, sought these airy retreats, where blankets are in request during the hottest nights of summer. Not even the spring region of Virginia or of New York can surpass that of Tennessee, in the splendor of the climate, the delightful coolness of the atmosphere, the wildness and picturesqueness of the scenery, or the health-giving properties of the water.

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APPENDIX.

Recent investigations justify additional facts concerning the mineral deposits in Tennessee, and her latent wealth. The present depression in the iron interest cannot be of long duration, and when it is profitable to produce iron anywhere, it must be so in Tennessee, where the iron and coal deposits are so rich and the mining and production so much cheaper than elsewhere. Hence the following descriptions of iron deposits are added, after careful personal inspection.

ORES OF CARTER AND JOHNSON COUNTIES.

Among the most noted deposits of iron in the State are those of Carter and Johnson counties. Carter's Forge, on Stony Creek, six miles from Elizabethton, is supplied with ore from the Cannon Bank. It occurs in a regular solid bed, resting upon a stratum of quartzose pebbles, while above and below, the rocks are sandy shale. The ore is hematite, angular, compact and very hard. The yield is 900 pounds of wrought iron to the ton of ore, using the Catalan forge, with 100 bushels of charcoal to the production of 250 lbs. of wrought iron.

An analysis of this ore, made by Prof. B. S. Burton, of East Tennessee University, for the Bureau of Agriculture, Statistics and Mines, gives the following results:

Cannon Bank.—No. 1.

Water	0.22
Silica	2.17
Metallic iron	59.75
Combined oxygen	25.60
Sulphur	0.06
Phosphorus	0.003

This shows just 100 times less phosphorus than the best ores in the Lake Superior region, while in the small percentage of sulphur it is equal to the best ores anywhere.

In smelting the ore from this bank, a flux is necessary. Charcoal costs four cents per bnshel, payable in iron at four cents per pound.

Carter's Furnace, about ten miles from Elizabethton, is supplied with ore from the Taylor bank. This ore is of a variety unusual in Tennessee, called shot ore. The matrix in which it is found is red and yellow clay. The ore is washed, and the waste water contains about three-fourths of the whole amount. The washed ore yields

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about forty per cent. of iron. It is perhaps the easiest smelted of all the ores in Tennessee. Although not noted for making bar iron, it is unsurpassed by any in the United States for making car wheels, for which purpose it is used at Knoxville.

In regard to this oar Prof. N. T. Lupton of Vanderbilt University, gives the following account:

No. 33 is "shot" iron ore from Carter county, Tennessee. This ore consists of small irregularly-shaped masses or grains of a yellowish-brown color. It contains 57.33 per cent. of pure iron. Specific gravity 3.31. Analysis:

Combined water	9.13
Silica	6.15
Sesquioxide of iron	81.90
Alumina	.28
Oxide of manganese	1.17
Carbonate of lime	.92
Carbonate of magnesia	.42
Phosphoric acid	.00
Sulphur	trace.
	99.97

These ore beds are peculiar. The entire area, of about twenty acres, is covered with chimney-shaped limestone rocks, with the apices uppermost, and pointed in solid rocks at the depth of from five to twenty-five feet. The ore is found between these rocks, and is mined, washed and delivered at $2.40 per ton. Charcoal costs six cents per bushel. In the vicinity labor is cheap; men, without rations, are hired for 75 cents per day.

At Speedwell, twelve miles from Elizabethton, a red hematite is found, yielding a tough, hard iron. 1,200 pounds of this ore, in a Catalan forge, make 300 pounds of bar iron. The ore is obtained at the Hodge ore bank, one mile and a half distant. To 300 pounds of wrought iron 100 bushels of charcoal are used. Wood-cutting privilege is four cents per cord, and coal is four cents per bushel.

The analysis of the Speedwell ore is given below. The ore is very compact:

Hodge Bank.—No. 2.

Water	5.41
Silica	10.32
Iron	51.50
Oxygen combined	22.07
Sulphur	0.03
Phosphorus	0.09

The mineral region along Stony Creek is one of the richest in the State, as regards quantity and quality. Twenty miles from its mouth lies Cross Mountain, a ligament uniting Holston and Iron mountains. Upon the very crest of this mountain, in Carter county, are found large deposits of red compact hematite. "Shady" is a mountain-environed valley in Johnson county, of about twenty square miles—the bottom of the valley being 3,000 feet above tide-water. It is

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famed for the purity of its iron ore. Several Catalan forges are in operation, using bog ore, which is abundant and easily mined, making a very superior soft hammered bar iron. It is mined at the southern foot of Holston Mountain, at a cost of one dollar per ton. The water level is reached at a depth of fifteen feet, and hence the thickness of the deposit is undetermined. The yield of roasted ore in the open-air forges is about fifty per cent. in bar iron. The ore has a curiously laminated appearance, and the iron made from it is remarkable for its malleability and tenacity of fibre. It has always commanded a high price, and has always found a market. On account of its softness and toughness, it is largely used in making rifle barrels. Generally the iron made at the forges along Stony Creek in Carter county is very hard, and is used extensively for horse shoes and wagon tire. The iron made from the ores in the valley of Shady is very soft. For fifty years it has been in active demand. Before the construction of wagon roads, it was bent semi-circularly and brought down the mountain on horse-back.

A famous iron region in Johnson county is on Little Doe Creek. This stream, a tributary of Roane Creek, skirts the northwestern base of Doe Mountain, and, passing around the southwestern end, enters Roane Creek thirteen miles below Taylorsville, the county seat of Johnson county. Doe Mountain is a detached mountain lying between Iron Mountain on the northwest and Stone Mountain on the southeast. It begins at Taylorsville, extending southwestwardly for the distance of twelve miles, and ending rather abruptly at the confluence of Little Doe and Roane Creek. The latter enters Watauga River eighteen miles below Taylorsville. Indeed, it is a mountain almost surrounded by the waters of these two streams. On little Doe Creek are four forges of about the same capacity as those mentioned. Timber is very abundant in the region of these forges, and ore can be procured for about one dollar per ton, payable in iron.

It is a singular fact that throughout the counties of Johnson and Carter the only available currency is bar iron. Iron is taken in exchange for shoes, coffee, sugar, calico, salt, domestic and other articles used by the people of the country. It is considered a legal tender in the settlement of all dues and liabilities. This bar iron, after being collected by the merchants, is sent out and sold in Knoxville, Bristol and other points affording a market.

Stone Mountain, about 5,000 feet high, lies a few miles southeast of Doe mountain. Between the two, or rather hugging the base of the latter, as has already been stated, flows Roane Creek. Between Stone and Doe mountains, near Shawn's Cross Roads, a few miles south of Taylorsville, is a high knob known as Gentry mountain. In the side of this mountain Donelly's bank has been opened. The excavation has been extended to a considerable depth, say fifteen or twenty feet, and the ore, a compact brown hematite, is so hard that blasting powder is used in raising it.

South of Taylorsville one mile, at a mill race on one of the head

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branches of Roane creek, and also on the road leading from the Powell and Watauga Turnpike to the Donelly mine, are fine outcrops of very superior limonite.

Five miles from Taylorsville, on the south-eastern side of Doe Mountain, there is a long gorge which separates this mountain proper from a protuberance called Little Mountain. Little Mountain is seven miles long and rises to the height of 800 feet. It is filled with a very rich limonite. The ore occurs in lumps and ledges, with an unctious clay of various colors, sometimes yellow, then white, and again of a deep maroon. The ore is also often imbedded in a bluish earth. It is easily mined, and many years ago it was the ore almost exclusively used in Carter Furnace. At present it is used only in some neighboring forges. Excavations in search of ore have been made all over the surface, every one of which reveals an abundant supply. The top the ore lies near the surface. Five hundred feet below, compact ledges also occur at a greater depth below the surface of the slope.

The cost of mining here is very low—fifty cents a ton, payable in iron, being the regular price. The yield of bar iron from the forges varies from 500 to 600 lbs. per ton of ore.

The ore at this place, so abundant and pure, could be reached by the construction of a branch railroad up the Watauga and Roane Creek, uniting with the Johnson City and Cranberry Railroad near Elizabethton, twenty miles distant. Probably no one deposit of limonite in the State exceeds that found just accoss Roane Creek from Little Mountain and in one of the spurs of Hog Back Mountain, which is an offshoot from Stone Mountain. It is known as Jackson's Big Iron Ore Bank. This ore forms a solid ledge near the top of the spur, with an exposure fifty feet thick and two hundred yards wide. It covers several acres superficially, and in all probability has a depth of 600 feet, as it outcrops in James' Creek, quite that distance below the crest of the spur. Half a mile further, on the same spur, there is another exposure equal to the one already described, with a number of smaller outcrops extending through several miles. The quality of the ore is not good. Though easily smelted it makes a "cold short iron," owing to the presence of phosphorus and arsenical compounds. In appearance this ore has a black tar color, is quite porous and breaks readily. Mixed with the ores of Little Mountain it makes a good iron. Large quantities were so used many years since in Carter Furnace.

Near Dugger's, on the Watauga river, eighteen miles from Taylorsville, a fine yellow ore is found in large quantities at Taylor's Bank, and also a greyish ore which yields about 400 lbs. of bar iron to the ton. Needle ore or gothite also occurs here.

Road Hollow Bank, about half a mile from the mouth of Dry Run Creek, near Dugger's Ford, has lately been opened and supplies a very desirable ore. All the hills around Dugger's Ford on both sides of the Watauga are filled with limonite.

Outcrops of ore continue for fifteen miles along Stone Mountain.

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The most valuable and interesting of all the ores of this region, is the great magnetic vein that begins at Cranberry valley, in Mitchell county, North Carolina, crosses on the north-western side of Roane Mountain in Carter county, re-entering North Carolina, and extending to the hills that overlook Nolichucky river. (See map.) In all, its length is about thirty-seven miles. This ore at Cranberry occurs in a spur of Hunchback mountain, on the south-east side of Cranberry Cove. The vein, inclosed between walls of metamorphic rocks and associated with sahlite, runs at this place nearly east and west. The spur rises to the height of about 600 feet and covers quite 200 acres. A long gorge lies along the summit of this mountain, sinking about one hundred feet below the crest, dividing the summit into two parts. The two faces of this gorge, as well as the bottom, show an outcrop of magnetic ore unsurpassed in richness, quantity and quality. The main load here crosses the ravine mentioned, in a line running south-east and north-west. It runs here two miles without a break and has a depth of quite 400 feet, and a width of 200 feet on the outcrop. On the face of the spur it makes great solid ledges. The ore from this place has been worked for many years in a little forge. It is very hard and tough and answers the purpose of steel in the manufacture of many farm implements. The ore, for the most part, has a black metallic lustre, of a granular structure and breaks readily. Some openings show an ore of a yellowish cast, which is known as "Rattlesnake" ore. This is more easily smelted than the black. All the ore is magnetic but not strongly so, and has the property of imparting magnetic properties in a slight degree to steel.

One mile and a half north-west of Cranberry is a small ridge, which forms the water shed between the waters of Elk Creek and Doe River, (not Doe Creek). Both are tributaries of the Watauga. The head waters of Elk Creek pass through Cranberry valley. The headwaters of Doe River take their rise in Crab Orchard, a cove that lies in Tennessee, and is the counterpart of Cranberry valley. This cove extends from the water shed mentioned, seven miles north-west, and is bounded on the north by Buck Mountain and White Rock—on the south by Humpback Mountain, Roane Mountain and Yellow Mountain.

The magnetic vein continues all along the south-western side of this cove in the spurs which shoot out from the mountains on the south-west. It is often cut out by ravines, but appears in the next spur. It does not differ from the Cranberry ore. It passes out of the State at an elevation of 3,650 feet above the sea. An analysis made by Prof. Burton is given below:

Magnetite from Carter County—No. 3.

Water	0.67
Silica	6.30
Iron	63.72
Combined Oxygen	24.29
Sulphur	0.06
Phosphorus	0.07

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The specimen analyzed was about an average sample of the ore. This ore is highly esteemed for making the best grades of steel. Experiments made with it in England show its eminent superiority in this particular. Steel made of it, only two removes from the ore, was used in the manufacture of the finest cutlery. Knives made of this steel would shave a nail without having the edge impaired.

This magnetic ore is within 80 miles of the coal fields, and passes through a region heavily clothed with dense forests. It is the nearest steel-making ore to Pittsburg, and must compete with the Lake Superior ores when proper outlets are constructed.

The water-power contiguous to this magnetic ore is excellent. At Cranberry several mountain streams have been collected in a lake that covers eight or ten acres. The water is let out from this lake through a race some 200 yards long, at the termination of which there is a fall of 36 feet. Other streams, as Roane Creek, Doe and Nolichucky Rivers, with their numerous tributaries, supply water-power of incalculable force. Factory, mill, or furnace sites are easily found, with ample power in almost every valley. Timber for building is convenient and abundant, and although a mountainous country, it possesses great fertility of soil, and the grazing privileges are equal to any in the United States. The vein crosses a series of high spurs, between which the streams have cut out valleys from 300 to 400 feet deep, thus making it easy of access. Hitherto this region has been out of the world of life and activity. Now a railroad is under contract and in process of construction from Johnson City, 24 miles south-west of Bristol, on the East Tennessee, Virginia & Georgia Railroad, to the iron region, opening communication between this rich deposit of ore and the coal fields of Tennessee.

While the quantity of ore in this magnetic vein would be equal to any probable demand in this locality, there are not wanting rich banks of limonite in Doe River valley. Twelve miles above Johnson City, the mountains widen out and make a third cove, known as Doe River cove. In this cove there are five good banks of limonite that have been worked. These are the Logan Bank, Cedar Hill Bank, Fork Mountain Bank, Hyder Bank, and Lacy Bank. The latter has a ledge of iron ore showing a face of five feet along the mountain for 100 yards. All these banks are found in the Chilhowee sandstone formation. The ore shows by analyses about 48 per cent. of metallic iron, with a small per centage of sulphur and phosphorus. Some of it is too siliceous for working. These banks are in the Stone Mountain range. In Carter and Johnson counties there are 18 forges in operation. They run from one to two fires, making daily each about 300 lbs. of bar iron.

ORES OF CHILHOWEE MOUNTAIN.

Between the Little Tennessee River and the Chilhowee Mountain are large deposits of ore only surpassed in East Tennessee by those first

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mentioned. Ten miles south-east of Maryville, a line of spurs begin, running out from the south-eastern slope of Chilhowee Mountain. This line of spurs continues for the distance of 20 miles to McGhee's Ford, the southern terminus of Chilhowee Mountain. Many of these spurs are filled with brown hematite of a good quality. A specimen obtained at Razor mines, on the Flats of the Chilhowee near its north-eastern extremity, which is a fair representative of all the ores of the mountain, shows by analysis the following:

Blount County Ore.—No. 4.

Water	7.54
Silica	21.29
Iron	47.10
Oxygen Combined	20.18
Sulphur	0.04
Phosphorus	1.44

A curious fact develops itself in this ore, and that is, the exceedingly small quantity of water in its composition, which is only about half that of the true limonite. The ore indeed approaches a red hematite, and in the south-western end of the mountain, on the farm of Esq. Harrison, beds of hematite are found, though generally too siliceous for profitable working. This deposit of the Chilhowee crosses the Little Tennessee at McGhee's ford, appears southward in the hills beyond the river, crops out in large blocks on Ball Play creek, and presents itself in great abundance at Tellico Plains, forming a noticeable feature of Stone Mountain, which is sixty miles from the Chilhowee "Flats." The same deposit runs north-easterly through Sevier county, and at Wolf's Creek, in Cocke county, rises in a mighty mass, forming Peck's Iron Mountain, from which it may be traced for many miles in the same general direction, appearing in Greene county, associated with the black oxide of manganese; in Washington county, with galenite until in unites with the almost matchless deposits of Johnson and Carter counties, of which mention has already been made. The whole line of deposits from Polk to Johnson is not less than 150 miles long.

Recurring to the ores of Chilhowee, while they are large they show in the outcrop more silicious matter than is found in most of the other deposits in Tennessee. Though the outcrop is siliceous, it is highly probable that the ore at a lower depth is of a better quality, as is the case in many of the banks worked elsewhere in the State.

Reference has been made to Peck's Iron Mountain. This is one of several that lie at the terminus of the Cincinnati, Charleston & Cumberland Gap Railroad, and form a line running north-east and south-west. This range of hills extends through a large part of Cocke county, and lies at the north-western foot of the main Unaka chain. The ores of these hills, the chief of which is Peck's Iron Mountain, are associated with sandstones and metamorphic rocks. Generally it is a hydrous peroxide with the oxide of manganese intermixed, but some specular ore is met with among the gneissoid rocks.

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Peck's Iron Mountain covers quite fifty acres, and the ore caps the mountain in great blocks or amorphous masses. For four hundred yards down the mountain the surface is covered with the great black masses. The other hills of the range occupy from ten to thirty acres and are separated from one another by deep gorges or ravines. An analysis of this ore made for this department gives the results below:

Ore from Peck's Iron Mountain.—No. 5.

Water	10.84
Silica	6.85
Iron	47.97
Oxygen combined	20.55
Sulphur	0.08
Phosphorus	1.71

It will be perceived that the amount of water in its composition is much less than the standard limonite, the latter having 14.4 per cent. It therefore approaches a hematite. There is considerable oxide of manganese in its composition, which was not separated in the analysis. It would doubtless be valuable for making spiegeleisen. The only feature about the analysis that is objectionable is the proportion of phosphorus, which would have the tendency to make a *cold short* iron.

The mountains are heavily timbered with white and yellow pine, chestnut, hickory, hemlock and poplar. The ore could be easily transferred by a tramway to the Wolf Creek Valley, where abundant sites for furnaces can be found. The cost of mining ore from Peck's Iron Mountain would not exceed thirty cents per ton. It is within three miles of Riverside Station on the railroad. Other extensive deposits occur in the county, but I have had no opportunity to examine them in detail.

BANKS OF McMINN COUNTY.

A bed of fossil iron ore, found in McMinn and Loudon counties, is remarkable as occurring in the Lower Silurian formation. All the other fossil ores are found in the Upper Silurian. This ore forms a long rounded ridge running N. E. and S. W. for two miles, with an average height of 75 feet, and width on the surface of 450 feet. The strata all dip at an angle of 20° to the S. E., and the ore lies between a bed of yellowish shale above and a variegated marble below. The following is an approximate section at this point:

Iron Limestone, forming red knobs	250 feet.
Calcareous Shale, buff colored	300 "
Fossil Ore, (Hematite)	75 "
Variegated Marble	125 "
Lithographic Stone, good and bad	30 "
Variegated Marble	60 "
Blue Limestone	Unknown depth.

The amount of ore here is immense, and there is no place known where it can be more easily mined. Not far from the bank begin the Red Knobs, abounding in excellent timber for making charcoal. The ore found in this bank (Thomas') has not been worked for many years.

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It is a red hematite, oolitic, and contains nearly as much water as the limonite of Chilhowee Mountain. Its good qualities may be inferred from the analysis given below, as also from the fact that it was used thirty years ago in making a bar iron whose excellent qualities have not been forgotten by the citizens of the neighborhood. The upper part is siliceous, but the ore becomes very fine a few feet below the surface. In the banks it is disposed in tile-shaped, angular masses having the same thickness. The broken layers are separated by thin strata of deep maroon-colored clay an inch or more in thickness. The following is an analysis of it:

McMinn Ore (Thomas' Bank.)—No. 6.

Water	7.85
Silica	9.67
Iron	56.65
Combined Oxygen	24.27
Sulphur	0.09
Phosphorus	0.52

Important deposits of good fossil ore occur in McMinn county besides that of Thomas' bank. These are found in the Upper Silurian in seams of varying thickness. The ore is excellent in quality and abundant in quantity. Most of the seams occur in Estanallee Ridge, that runs nearly through the centre of the county in a north-east and south-west direction. This ridge has an elevation of quite 400 feet and is densely clothed with timber. The soil is fertile, the slopes steep, and limestone prevails throughout its entire length.

The ore lies in two or three seams near the crest of this ridge. On the lands of W. B. McKamey, three miles from Riceville, several openings have been made, which display a seam 18 inches thick. This seam lies between two strata of blue limestone of the Upper Silurian. Immediately above the limestone is a layer of red clay three feet thick, then a yellow shale which is capped by a dark sandy shale. The strata here all dip to the south-east, making an angle of 10° with the plane of the horizon. The openings are near the top, and the iron ore reappears at a lower level on the south-eastern face of the ridge. The lower outcrops show an ore highly calcareous. Specimens taken from the higher outcrop on McKamey's land analyze as follows:

Fossil Ore (McKamey's Bank.)—No. 7.

Water	1.02
Silica	13.82
Iron	60.21
Combined Oxygen	25.80
Sulphur	0.09
Phosphorus	0.72

Easterly a few miles from McKamey's, the ridge separates into two arms. A ligament on the lands of L. B. Dodson, Esq., unites the two arms. On the cross-ridge or ligament the ore outcrops in large masses at a much lower level than in McKamey's land, and shows a considerable amount of carbonate of lime in its composition. It is regularly stratified, however, and the line of strike is nearly north-east

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and south-west, with a dip to the south-east. The outcrop shows a thickness of nearly five feet, but this ore is of no great value, except as a flux, owing to the predominance of the carbonate of lime. About half way this cross-ridge there occurs an anticlinal axis, the dyestone ore appearing just below a yellowish shale within fifty feet of the top. On the south-west side of the main Estanallee Ridge there are said to be three distinct strata of the fossil ore, but I could only find two; the upper one being from 11 to 18 inches thick, the lower one about the same. Upon the crest of a high hill, some twenty feet above the upper seam, is a considerable outcrop of excellent ore. Large blocks lie scattered about the field, which are probably the remnant of a third stratum which has been carried away by erosion.

On the lands of Mr. Dodson, there is a spur running north-west from the main ridge and nearly opposite the cross-ridge heretofore spoken of. Upon the western face of this spur fossil ore appears in workable quantities imbedded in a matrix of black siliceous earth and yellowish clay. The ore from this place is very beautiful, having a rich royal purple lustre. It occurs in square and angular blocks in all sizes, up to a flour barrel. Fossils abound in it, such as crinoidal buttons, fragments of trilobites and small corals. It is very pure and is universally admired. An analysis gives the following:

Fossil Ore (Dodson's Land.)—No. 8.

Water	1.32
Silica	13.14
Iron	60.03
Combined Oxygen	25.72
Sulphur	0.024
Phosphorus	0.13

In another ridge lying between the two arms, but farther north-east, a great mass of fossil ore appears on the side of the ridge, that will weigh many tons. It is four or five feet across and lies in a bed of rocks that shows great disturbance. This ore is very hard, and judging from its appearance it is very rich. Above there is a stratum of limestone deeply tinted with red. This outcrop is on the lands of Hon. N. Dodson. North-east of this place outcrops of fossil ore are numerous in Estanallee Ridge and in its spurs and outliers. Several of these, belonging to J. L. Carruth, are promising. One average sample analyzes as follows:

Ore from Estanallee Ridge.—No. 9.

Water	1.10
Silica	18.05
Iron	56.58
Combined Oxygen	24.24
Sulphur	0.04
Phosphorus	0.63

Two seams appear all along Estanallee Ridge for many miles. The timber on the ridges is of very superior character, while the soils are among the best in the State, and highly productive of the bread-grains. Water power is furnished by the numerous parallel streams that empty into the Hiwassee river, and railroad communication by the East Tennessee, Virginia & Georgia Railroad.

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WESTERN IRON BELT.

In Safford's Geology of Tennessee it is stated that the iron ores of this belt, with one exception near Clifton, in Wayne county, are classed among the brown hematites or limonite. Further investigation has shown this statement to be too sweeping. Associated with limonite oftentimes is a "*Needle ore,*" or *Onegite,* an acicular Gothite, sometimes radiately grouped and resembling a rosette. It has usually a fibrous structure with the aciculæ parallel, separating easily into fine needles. A fibrous hematite is sometimes found associated with the other ores, though rarely. A beautiful specimen, found at Lagrange Furnace, Stewart county, analyses as follows:

Fibrous Hematite.—No. 10.

Water	3.65
Silica	1.96
Iron	65.92
Oxygen combined	28.25
Sulphur	0.04
Phosphorus	0.12

The analysis shows it to be very pure.

Another variety of iron are found throughout this region, belonging to the hydrous oxides, has been classed as a limonite, though really richer. It is known to mineralogists as Turgite. It has a sub-metalic lustre and flies to pieces when heated in a closed tube. It form oftentimes the interior of the "pot" ore, sometimes the exterior of compact ore, and the line of demarcation between this and the limonite is distinct. Prof. Burton analysed a specimen of this from Cumberland Iron Works, Stewart county, taken from the interior of a hollow iron concretion (pot ore) with the following result:

Mainly Turgite from Pot Ore.—No. 11.

Water	8.38
Silica	2.19
Iron	63.09
Oxygen combined	27.03
Sulphur	0.07
Phosphorus	0.38

The result of these analyses were so unexpected that I addressed a note to Prof. Burton, asking a word of explanation. In reply Prof. Burton says:

"KNOXVILLE, June 12, 1876.

"In regard to the two ores in question, Nos. 10 and 11, permit me to add the explanation of their apparent anomaly; and, if you will excuse the liberty, I will also add a few remarks on iron ores generally.

From a metallurgical point of view there are two classes of ores, (I leave out those which have no bearing on the point in question,) the red and brown hematites (limonite.)

The Red Hematite is $Fe_2 O_3$, which, when chemically pure, contains no water, but this never occurs so in nature, containing always more or less water, say the highest amount being 4 per cent. in rich ores.

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The Limonite, like the red hematite, of *all grades of purity*, is represented by 2 Fe_2, O_3 + 3 Ho.

The *water* varies from 16 to 10 per cent. in rich ores, but *between* the "red and brown" come two other oxides of well-determined composition, viz: Turgite and Gothite occurring with the other two oxides (red and brown hematites). I give them in order, also with pages in Dana.

		Fe_2 O_3	Iron.	Water.	Page in Dana.
Red Hematite,	Fe_2 O_3	100	70.	0.0	140
Turgite,	2 Fe^2 O_3, HO	94.7	66.29	5.3	167
Gothite,	Fe_2 O_3, HO	89.9	62.93	10.1	169
Limonite,	2 Fe_2 O_3, HO	85.6	59.92	14.4	172

In the above it must be recollected that this is the theoretical composition, which very seldom, *almost never*, occurs in nature. The analyses (made from carefully selected pieces) quoted, show only how near they approximate these numbers.

Of course, when the amount of *water* increases from any admixture (perhaps of another oxide of iron) the amount of iron must decrease proportionally.

Now in regard to *Turgite*—this is usually taken for limonite; it forms the shining black crust on limonite specimens, generally about ¼ inch thick, which separates easily from the rest; is formed from limonite by the loss of two molecules of water; the next step being to pass into red hematite. This is "often taken for limonite." (Dana, 108.) The specimen No. 11, consisted mainly of Turgite with limonite, the latter raising the per cent. of water and lowering the iron. The *averaged* sample giving 90.12 per cent. Fe_2 O_3, or 63.09 Iron, of course, in a ton the amount of Turgite would be proportionally much smaller, perhaps lower the iron to some 50 odd per cent.

In regard to the "*Needle Ore.*" "Needle ore" is a name applied to a hydrous oxide of iron of the composition of Gothite, in fact is Gothite. See Dana, 170, var. 2.

The specimen No. 10 corresponds in physical properties closely to the description I allow, ("reddish and blackish-brown"), but here it ends.

This calls for a streak (its fine powder) of a "brownish-yellow or ochre-yellow," like the other hydrous oxides, but No. 10 gives a *bright red streak* like the anhydrous oxide.

To belong here it must give at least 9.47 water or somewhere near the theory (the specimen was small and pure) which is 10.1, but it contains only 3.65 per cent of water. (The water determination I repeated today with the same result.) The iron for Gothite should not be over 62.93 per cent., while the iron found is 65.92 per cent.

Now the truth is, this ore (or at least the small specimen examined) is a fibrous *red hematite*, all statements to the contrary notwithstanding It is, by no means, an uncommon form of red hematite, and I entered it as such in my book before the analysis was made—for description

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see Dana, p. 141, var. 2: "Compact columnar; or fibrous." I notice what Safford says in his Geology, p 436, note, but his statement is, probably, not founded on proper investigation, and will have to be modified.

Allow me to call your attention to p 930: "Resources of Tennessee." An analysis made by E. S. Wayne, of an ore from "Lagrange Furnace," in which is found 65.75 per cent. iron. I do not know what ore this was, but I strongly suspect it to be the same red hematite as No. 10. The note was made on the assumption that the ore is limonite. The amount of iron is *very near* the same as I find in the red hematite—which comes from the same place. I trust that this will be satisfactory to you, and you may make any use of the facts you desire. The result of the whole thing is this, that No. 11 was mainly Turgite, and No. 10 is a fibrous red hematite, which the streak and analysis abundantly prove.

Yours Truly,

B. S. BURTON."

With few exceptions, all the ore of the Western Belt is brown hematite. This occurs in various forms; *pipe ore,* resembling reeds agglutinated together; *pot ore,* or hollow concretions, yellow ocre, a brownish, yellow soft mass; *black jack ore,* a black, compact coal-like mass; *honeycomb,* filled with small cavities resembling honeycomb; *shell ore,* having contorted laminæ resembling a mass of shells; *needle ore,* or gothite, fibrous and acicular, which separates into small needles when struck; (this is often a hematite); *shot ore,* which occurs in small shot-like particles; *bog ore,* which usually occurs below the water level and shows a laminated structure, The pot ore mentioned is a hollow concretion filled usually with water, but sometimes with sand, and occasionally with fossils. The size of these pots is variable; sometimes they are as large as a hogshead, and then again not larger than an orange. Externally the pots are rough. The interior surface has often a silky metallic lustre; sometimes very smooth, with a velvety black color; again stalactitic, mammillary, or botryoidal, highly polished and resisting oxydization in a remarkable degree. The internal coating for an inch or more in some specimens, is fibrous or sub-fibrous, the fibres being perpendicular to the internal surface, forming rays pointing to the center. Occasionally the internal surface is covered with ridglets intersecting one another at every possible angle, giving it a magnified honeycomb appearance. The play of iridescent colors upon the polished mammillary surfaces, is sometimes beautiful. The sand which is occasionally found enclosed has the singular quality of being always in motion, which is no doubt due to its exceeding fineness. It is called *silica vivans,* because of its ceaseless movements. Prof. Lupton of the Vanderbilt University was the first to call attention to this phenomenon.

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VERNON FURNACE.

This Furnace lies in Montgomery county, eight miles from Clarksville. It is the only one of several valuable iron properties and old furnace sites now used. The character of this country is the same as that found in Dickson and Stewart counties, adjoining on the west and south—the cherty hills of the lithostrotion bed, with steep slopes, and thin soil on the south hill sides, and very fertile on the north hill sides and in the valleys. The country is mostly divided by the action of water into long ridges, which are fissured with deep gullies, showing ferruginous subsoil and often outcrops of ore. The entire region is well watered with fine bold streams, with much excellent water power, and is exceedingly well timbered. The following statement from the books of the company working this furnace, shows the cost of making iron in this belt, with first rate management:

Number of tons made in 170 days—1,900.
Cost, including hauling to the railroad and loading cars—$34,977.
Cost per ton—$18.40.
Capacity of Furnace—14 tons.
Charcoal used to ton of iron—135 bushels.

The ore used ¼ lump and ⅜ fine pea ore washed and dried; 3.67 tons of raw ore, or 5,300 lbs. of roasted ore, make one ton of iron, and 2268 lbs. of limestone, or one ton, cost 85 cents.

Coal costs six cents per bushel of 2688 cubic inches.

Wood 50 cents a cord, payable in goods.

The average of the land is 40 cords per acre. The timber consists of oak, poplar, and hickory. The charges are as follows:

Coal	30 bush.
Fine ore	700 lbs.
Lump ore	300 "
Limestone	120 "
No. charges in 24 hours	62

The iron made is a mild, cold short, nearly neutral iron. It is sold as mill and is one-half mill, 2-5 foundry, 1-10 silver grey. On account of its hardness, rolling mills have given it reputation for rail heads and horseshoe bars.

We have already referred, on page 136, to Steele's Bank in Montgomery county, and the great extent of the deposits of iron ore at that point. These deposits extend over the whole of the south-western corner of the county. At Vernon Furnace, 10 miles south of Clarksville, the banks are very rich. There are many finger-like spurs projecting out from the general level of the country. These spurs have extensive deposits of ore, but occasionally a "dirt horse" is encountered which continues for several feet. Surface ore is not always the best sign, as it may indicate an erosion of the upper surface and a degradation of the ores into fine particles, which are swept away by heavy rains in a great measure, or left exposed upon the surface.

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The main deposit at Vernon Furnace lies south of the furnace stack. That north is rather siliceous. About 640 acres are filled with large deposits of limonite. At one place is a face of ore 38 feet high. About three-fourths of this bank is fine ore; that is to say, the lumps will average about an inch in diameter, though they are often seven or eight feet through. When the clay is chalky in appearance, with slight stains of red, rich ore is apt to be found underneath. The white appearance of the clay may be due to the separation of the oxide of iron by percolation. The ore is so abundant that one hand often raises three tons per day. One mile east of the furnace is found a bluish ore which it less refractory than the "black jack" ore found immediately around the furnace. This blue ore requires for smelting 35 bushels of coal less per ton of pig iron.

The ore beds around Vernon Furnace have been worked for 35 years, and new exposures are constantly made. The facilities for transportation are excellent. The Cumberland river and the Memphis branch of the Louisville, Nashville & Great Southern Railroad being within three miles of the banks.

Another very extensive bed of ore is Bryan's Bank, which lies on the north bank of Cumberland river, twelve miles below Clarksville, opposite Palmyra, which is a station on the railroad. This ore is mainly pipe, with some honeycomb. It has been dug to the depth of 85 feet without exhaustion. At this depth the water level was reached and the diggings extended laterally. The deposit extends in an irregular line, running north-east and south-west and comes to within three feet of the surface. It increases in compactness with the depth. The elevation of the hill above the water level of the river at low water is 90 feet. This hill is bisected by a little stream that enters the Cumberland. On the north-east side of this stream several pits have been sunk and the same quality of ore found, showing a width of quite 400 yards. It passes across the river and re-appears on the southern side. For making a tough iron or as a base for Bessemer steel, no ore yet found in the State is superior to this. It has been fully tested for both purposes. It is also much richer than is usual with limonite, yielding from the furnace 49.61 per cent. without roasting. In other words, a ton of pig iron was made from very little over two tons of *raw* ore. It is very uniform in quality and the deposit is singularly free from pot or black jack ore. The porosity of the ore makes it easy to smelt, and it is a favorite with all furnace men who have tried it. Much of it has been shipped to Pittsburg, and it has in every case given satisfaction.

IRON INTERESTS OF STEWART COUNTY.

Stewart county has advantages over any other section of the State, for the cheap production of charcoal iron, and its transportation to market. The ores are practically inexhaustible, and yield from 57 to 59 per cent. of pure metallic iron, are easily smelted, and produce iron of a very superior quality.

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ROUGH AND READY.

This furnace, near the north bank of the Cumberland river and the Montgomery county line, lies in Stewart county. It is the centre of a large and valuable tract of land of about 8,000 acres. The deposits of limestone on the north bank of the Cumberland, cover an area of about 25 or 30 square miles in Tennessee, extending into Trigg county, Kentucky, and running to the Ohio river in Crittenden county. Every variety of limonite is found here; pipe, pot ore, black jack, etc., are found in all directions from the furnace for 5 or 6 miles around, and in some of the banks the ore is mingled with a crystallized, almost transparent, massive gypsum. This is a part of the iron field which furnishes the celebrated Tennessee Boiler Iron. The Kentucky line is eight or ten miles north of Rough and Ready Furnace. The banks around this furnace, and those about old Bellwood, are the only ones of value found on the north side of the Cumberland in Tennessee. This furnace has not been in blast for two years.

CUMBERLAND IRON WORKS.

The two largest iron properties in Stewart county are the Cumberland Iron Works, owned by Woods, Yeatman & Co., and the Lagrange Iron Works, owned by J. C. Garrett and others. These two companies own one hundred thousand acres, which connect and run together for twelve miles on the crest of the Tennessee ridge, which is the water shed between Tennessee and Cumberland rivers.

The Cumberland Iron Works property contains sixty thousand acres of land, and is the best charcoal iron property in the United States—perhaps unsurpassed in the world. It has thirty thousand acres of original growth of timber now standing, while the second growth coming on covers twenty thousand acres, six thousand acres of which are in good condition for making charcoal. This property lies on both sides of the Cumberland river, and has a front on either side of five (5) miles. Five streams, fed by innumerable springs, flow through this immense domain and enter the Cumberland river from the north and the south. The ores on the north side of the river and adjacent to Bellwood Furnace, are in two high ridges lying between Cross and Cub Creeks,—and these ridges are covered with fine rich soil, the growth of which is walnut, poplar, sugar tree, hickory, beech, oak, etc. This ore, as analysed by Prof. J. Blodgett Britton, of Philadelphia, shows:

Ore from Cumberland Iron Works.—No. 12.

Pure metallic iron			57.84
Oxygen with the iron			24.37
Water			11.96
Insoluble siliceous matter			3.59
Soluble silica			.78
Sulphur			none.
Phosphoric acid	Phosphorus,	.24	.54
	Oxygen,	.30	

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Alumina	.13
Lime	.05
Magnesia	.03
Manganese, undetermined matter, and loss	.71
	100.00

There are other large deposits of iron ore on the north side, but as they have not been needed at all, they have not been developed.

The ores on the south side of the river are in almost every hill, ridge and ravine within a circle of ten miles in diameter, the principal deposit of which, however, is in two high ridges, covered with a rich soil. These ridges begin within half a mile of the Cumberland and run parallel one with the other to Long Creek, five miles distant. These ores, as analysed by Prof. Britton, produeed:

Ore from Cumberland Iron Works.—No. 13.

Pure metallic iron	59.22
Oxygen with the iron	24.88
Water	11.06
Insoluble matter, white sand	3.21
Soluble silica	.13
Sulphur	none.
Phosphoric acid { Phosphorus, .16 / Oxygen, .20 }	.36
Alumina	.49
Lime	.17
Magnesia	.06
Manganese and loss	.42

Analyses of two other specimens taken from a bank near Bear Spring Furnace, which is situated on this property, have been made by Prof. Burton of East Tennessee University. One of pot ore, No. 11, has already been given on page 173. The other is of pipe ore, and yields:

Pipe Ore.—No. 14.

Water	10.94
Silica	4.77
Iron	59.98
Oxygen combined	25.70
Sulphur	0.11
Phosphorus	0.40

These are the ores that have been smelted at Dover, Bear Spring and Bellwood Furnaces by Woods, Yeatman & Co., and their predecessors, from 1829 to this day, and which established the superiority of Tennessee Iron. In 1830 Yeatman, Woods & Co. shipped a cargo of pig metal on the steamboat Thomas Yeatman to Pittsburg, and from that time to this, forty-six years, Tennessee Iron has had a reputation for good quality almost unequalled.

And although these deposits have been drawn upon to supply ore to from two to five furnaces for nearly half a century, it is nevertheless true that the ores of this property are not yet developed—the bottom has never been reached, the extent of the deposit is not known, and what has been done in 47 years only goes to show that the ores of this property are practically inexhaustible.

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Thirty thousand (30,000) acres of this estate is suitable for cultivation, and will produce profitably tobacco, wheat, corn, oats, barley, potatoes, blue grass, timothy, herds grass, apples, peaches, grapes, etc.; and fully 15,000 acres is No. 1 land; river bottom 5,000 acres; creek bottom 5,000 acres; rich hills not too steep for cultivation 5,000 acres, upon which are now standing poplar, beech, hickory, oak, sugar tree, dogwood, and grape vines in abundance.

There are four furnace sites on this property, Dover, Bear Spring, Bellwood and Randolph, all of which have been improved and are so located that timber, iron ore, farming land, fire-clay, limestone and water are convenient and abundant to all. Stone-coal of excellent quality for coking is within 100 miles by rail.

The four farms of the Cumberland Iron Works produced in 1861:

45,000 bushels of corn;
1,000 tons of clover, timothy and herds grass hay;
2,000 bushels of oats;
300 bushels of barley;
200 bushels of rye;

with potatoes, turnips, cabbage, and other vegetables sufficient for the entire population of the works, about 3,000 persons.

LAGRANGE IRON MILL COMPANY.

The furnaces belonging to the Lagrange Company are situated near the Tennessee river, in the south-western corner of Stewart county, and are operated by the same company. They are within a mile of each other, a small stream called Leatherwood, a tributary of the Tennessee river, separating them. Another furnace, the Eclipse, not in running order, belongs to the same company. This is five miles east of Lagrange Furnace, on Hurricane Creek.

Embraced in the company's property are 45,000 acres. The Louisville and Nashville Railroad runs through it, and it has a river front, interrupted by a few farms, extending for ten miles. There are about 9,000 acres of timber of the original growth, and twice that amount in second growth, much of it large enough for coaling purposes. Seven hundred acres are cleared and in cultivation, mostly river bottoms. The arable land is rented or leased to tenants by the company, the tenants agreeing to pay one-third of the crop and to sell the surplus to the company at rates agreed upon at the beginning of the year. Near the furnaces are five hundred acres of land, with excellent soil, not yet opened.

Clark Furnace has a capacity of 17 tons per day. It is a hot-blast, charcoal furnace, stone stack 36 feet high, and ten feet across the bosh. The hot-blast consists of 32 upright pipes, with 27 cross pipes under the boilers. An attempt was made by building a wrought-iron turret 12 feet high upon the top of the furnace, to utilize the hot-blast taken out at the side flues, as is done with the stone-coal furnaces, but it failed owing to the feebleness of the charcoal gases. It was afterwards

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changed to a combination of Magoon's and Player's hot-blast. This furnace is within two miles of Tennessee river.

Lagrange Furnace has a capacity of 15 tons daily. It has a brick stack 35 feet high and nine feet across the bosh. It has the ring hot blast with cross pipes under the boilers. Ores of pure quality are found all around these furnaces. North-east of Clark Furnace, half a mile, some pipe ore has been recently discovered, though the quantity is inconsiderable. It is quite probable that it would be found in workable quantities by more extended excavations in the hill in which it found.

The bank most used in connection with Clark Furnace, is situated half a mile north-west of the furnace, and occupies the crest and slopes of a ridge running east and west and quite 200 feet high and three quarters of a mile long. The openings are on the northern slope mainly. The ore is easily mined, occurring mostly in large pots. A little east of this bank is another, which though but recently opened promises well. Here the ore lies in large compact measures imbedded in a yellowish gravelly clay. From this bank, which occupies the crest of the ridge, the ore could be taken by a tramway to the furnace—the distance being less than half a mile. From indications on the southern slope of the ridge, the ore here is fully forty feet thick. Throughout the whole ridge, are abundant signs of ore of good quality. The sides and crest have been denuded of timber, which has been consumed in the manufacture of charcoal.

The old bank, 600 yards from Lagrange, has been worked for a quarter of a century, and excavations, covering an acre in the aggregate, have been made to the depth of 50 feet; and several drifts have been run into the sides of the hill. Black jack and pot ores are most frequent in the old banks, and great boulders of these ores are seen on the sides of the excavations.

At the greatest depths the pots are not so numerous and the ore becomes more compact and freer from impurities. A boring has been made 80 feet below the water level at the old bank, disclosing ore of prime quality all the way down. Adding this to the height of the bank, makes 130 feet of clear ore.

The Sheridan Bank, recently opened, is one of the best in the State, and the only one in which the company employs hands to work by the day. The bank here shows a face of ore nearly solid, forty feet high and 250 yards around. The bottom of this bank is solid ore. Great curtain-like mosses sometimes occur, hanging from above 20 or 30 feet in height, contorted like the folds of heavy cloth. These curtains, when broken, are found to be crystallized, showing an internal structure, zigzagged, radiated, mammillary, and spiculated. They are usually about two inches thick and furnish an excellent ore, which works easily. The stripping here varies from five to six feet. The same deposit is discovered in the ridge half a mile further south.

A bank near the river furnishes an ore nearly resembling bog ore; and another, the Lew Wallace bank, near by, affords a small ore which

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is washed by a machine and mixed with other ores. Lagrange Furnace itself is situated on an ore bank, and south of the furnace is a ridge which yields ore for six miles. The ores of the banks attached to these furnaces are among the richest in the State. A piece of the "curtain ore," containing small stellated nodules, analyzes as follows:

Ore from Lagrange Furnace.—No. 15

Water	10.76
Silica	5.45
Iron	59.57
Oxygen combined	25.53
Sulphur	trace.
Phosphorus	0.16

A analysis of needle ore, or fibrous hematite rather, taken from the Lagrange banks, has been given on page 172.

Another specimen, analyzed by J. Blodgett Britton of Philadelphia, gives the following results:

Ore from Lagrange Furnace.—No. 16.

Water	9.10
Insoluble silica	1.40
Pure iron in the form of sesquioxide	52.97
Oxygen with iron	23.41
Alumina	1.36
Lime	.40
Sulphur	.03
Phosphorus	.06

Prof. E. S. Wayne, of Cincinnati, obtained the following result from a selected piece of ore, which shows a correspondence with No. 10, analyzed by Prof. Burton:

Ore from Lagrange Furnace.—No. 17.

Peroxide of iron	95.34
Phosphorus and sulphur	trace.
Potash	trace.
Lime	.21
Silica	3.71
Loss	.74

Equal to 65.75 per cent. of pure iron. This, like No. 10, must have been a hematite.

A piece of concretionary or pot ore, from Clark Furnace, which enveloped a fine sand, shows the annexed analysis:

Ore from Clark Furnace.—No. 18.

Water	10.54
Silica	12.35
Iron	52.07
Oxygen combined	22.31
Sulphur	0.09
Phosphorus	0.14

This ore also contains manganese.

Fire-clay of excellent quality is found between Clark and Lagrange Furnaces, convenient to both.

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The whole region included between the Tennessee and Cumberland rivers in Stewart county, is singularly rich in iron ores. Sandstone also occurs upon the highest hills, eight or ten miles north of the Lagrange Furnace, and answers well for furnace hearths. It is a loosely cemented rock, very soft to work, but is said to be as durable for furnace hearths as the "Junior" sandstone from Ohio. Limestone is everywhere abundant on the streams.

Some excellent iron properties occur farther north. At Payne's Landing, there are several fine outcrops of good ore, some of which has given satisfaction in Pittsburg furnaces. This is in the midst of great forests of valuable timber, and within one mile of the Tennessee river. Another property, said to be very valuable, consisting of 12,000 acres, lies between the two rivers, which at that point are within a few miles of each other. There is an old stack and excellent roads to both rivers. This property has been in litigation, and was only lately thrown on the market. It is called the "Great Western Furnace" tract.

LAWRENCE COUNTY ORE.

The south-western part of Lawrence county has valuable deposits of limonite, at no distant day to become of great importance, since the county is soon to be opened by a narrow guage railway running from Memphis to Knoxville, much of which is now under construction. This iron region is a part of the Western belt, and the ore begins six miles south-west from Lawrenceburg. The ridge in which it occurs at that point, extends north-west and south-east, uniting on the west at the distance of two miles, with the main deposits, which traverse the western part of the county in a direction north and south. For many years the ore obtained at this point was used in some forges in the vicinity of Lawrenceburg. The quality of iron was very superior for blacksmithing, being soft, tough, yet easily wrought. The ore is mainly pot, with some black jack. In the latter, doubtless, is a trace of manganese.

Nine miles south-west of this bank, on the dividing ridge between Knob and Chism Creeks, affluents of Shoal Creek, is an outcrop of limonite, covering several hundred acres. This is known as Wright's bank. The country is dissected by gorges into rounded hills and flat ridges. Upon the tops of these hills and ridges, and also upon the slopes, the ore shows itself in great abundance. Wherever a gully has been eroded, the sides are roughened with blocks of ore imbedded in a rich, unctious, red clay.

Ore from Wright's Bank.—No. 19.

Water	11.83
Silica	1.01
Iron	59.60
Oxygen combined	25.54
Sulphur	0.16
Phosphorus	1.06

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This shows great richness for limonite, and an almost inappreciable amount of silica. Indeed the ores of Lawrence county are singularly free from all extraneous substances. Even the surface ore is workable and exists in considerable abundance.

The soil is of more than average fertility, and the timber, especially on the northern slopes and in the valleys, will yield from 40 to 60 cords of wood per acre. White oak, red oak, chestnut, poplar,* hickory and postoak, named in the order of their predominance, are the principal varieties on the hills; while beech, sugar trees and a few walnuts occur upon the lower lands.

West of Wright's bank, across Chism's Fork, is the Tucker bank, which presents ore of the same quality and equal in quantity to the Wright bank.

Two miles north of the Wright bank, on the same ridge, is the Wisdom bank, which is not inferior in the quality of its ore to any mentioned.

Pullen & Couch's bank, covering 200 acres or more, is on the west side of Shoal Creek, three miles further south. Shoal Creek is a tributary of the Tennessee river.

Two miles below the last named bank, on the east side of Shoal Creek, is the Ford bank, which is one mile long and quite half a mile wide. Lying underneath this bank is a crystallized carbonate of lime, which bears a good polish and is much admired by some persons. It has a subdued yellowish tint, with blotches or dots of red.

The old Vanleer banks, which were worked from 1830 to 1835, are two miles west of the last mentioned, and consist of several groups of rounded hills.

To sum up the advantages which this county affords for the manufacture of iron, we may say:

1. The ores are very abundant and pure, easily mined, and easily smelted.
2. The timber is superior to that found in any other iron district in the State.
3. The country is well drained, the whole region healthy, the soil productive, and the lands cheap.
4. The region is well watered, there being more water-powers occupied in this county than in any other in the State.

The outlets now building, and the land with its resources unlocked by reason of these outlets, and the tide of immigration which is pouring in, will make this one of the most prosperous counties in the State.

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* Wherever poplar is used in this work, the *lyriodendron tulipifera*, or tulip tree, is meant.

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CUMBERLAND FURNACE.

This furnace is in Dickson county, and lies upon Barton's Creek, a tributary of Cumberland river. It is hot-blast, charcoal, and has a capacity of 12 tons per day. Height of stack 35 feet; between the bosh 10½ feet. The hoop blast is used, by which the blast is heated to about 800° before entering the furnace. This was substituted for Dove's, with a manifest increase in the temperature of the blast. The engine attached has a cylinder 16 inches in diameter, stroke 5 feet, 2 boilers 40 inches by 40 feet, 2 air cylinders 40 inches in diameter, 4½ feet stroke. Thirty-eight charges are made in 12 hours, each containing:

Charcoal	20 bushels.
Ore roasted	800 lbs.
Limestone	80 lbs.

The quality of the pig is No. 1 Foundry iron, open grained, dark gray, soft strong iron. About one-tenth is mill iron. The employees are all hired by the year. Nearly all have families and are settled on the place. They are mostly negroes.

The following prices were paid for labor in 1875. For the present year wages have been largely reduced:

Common laborers, per month and rations	$ 18 00
Keepers, per month	30 00
Fillers	30 00
Superintendent, per annum	1500 00
Foundryman, per annum	1000 00
Book-keeper, per annum	1500 00
Coaling ground manager, per annum	700 00
Two farm managers, each, per annum	600 00
Ore bank manager, per annum	700 00

All employees are paid in goods, except such sums as may be due them at the expiration of the year or term of contract. Most of the employees, however, keep up with their wages. The proprietor, Capt. Drouillard, estimates that by hiring his hands for wages and exercising a vigilant superintendence, the cost of charcoal does not exceed 6 cents per bushel of 2688 inches. Ore is delivered at two dollars per ton green from the banks. After being roasted and screened, the yield from the furnace is about 50 per cent. Hearthstones are obtained from Sciota county, Ohio, twenty miles above Portsmouth.

The ore is dug from the north side of Barton's Creek, from a line of hills running westward from the furnace for six miles. The first bank is on the side of a ridge facing south, half a mile west of the furnace. It has been worked for 78 years, but exhibits no signs of exhaustion. The pot ore is found in this bank mainly. The internal surface of the pots is sometimes splendidly beautiful in its irridescence. The mining has been done in this bank to the depth of sixty feet. The ore is overlaid by agglutinated chert and orange sand. The stripping varies from two to fifteen feet, and one man is able with ease to raise two tons per day. About one keg of blasting powder is con-

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sumed each week in the mines. A few of the lumps of ore are very large, weighing sometimes from 50 to 60 tons. The large blocks are usually massive and not hollow concretions, and the value of the ore is sometimes, but not often, impaired by the predominance of siliceous matter in the form of chert. The matrix is a clay varying in color from a light cream to a deep red. The ore lies in sinuous lines or veins, thinning down to a mere thread, or swelling out into great lentiform masses, fifteen or twenty feet thick. These lines or veins are groups of blocks separated by thin seams of clay.

A quarter of a mile farther west is the McCurdy bank, which has been worked by the present owner about five years. The ore found here is heavier and purer. A deep red clay constitutes the matrix, with striated veins of white clay. The excavations are not as numerous as at the Bell bank. The mining, however, has been carried to the depth of 50 feet. At that depth a bed of solid ore forms the bottom. Few pots are found here. The ore is more compact. After being roasted it yields 55 per cent. from the furnace.

West of this 300 yards, is the Drake bank, which displays more solid ore than either of the others mentioned. The ore in this bank lies at a lower level and occurs in great ledges, which crop out above ground in the ravines and depressions. It resembles blocks of bituminous coal. It is very black and has a rich greasy and glossy appearance. An analysis of a specimen from this bank gives the following result:

Ore from Cumberland Furnace.—No. 20.

Water	10.13
Silica	5.21
Iron	58.68
Oxygen combined	25.14
Sulphur	0.07
Phosphorus	0.84

This specimen also contains manganese, and would probably make spiegeleisen. The matrix is red, white and yellow clays. Specimens of needle ore are met with in this bank. The excavation has gone below the surface 25 feet. This bank is not in the main ridge, but in a spur that runs out from it in a southerly direction.

Still farther west are the Burton bank, Yellow bank, Dry Hollow bank, and many others, which will compare favorably with those already mentioned. The only objection to them is their distance from the furnace. The practice is to work the banks during the dry weather of summer, undermining and leaving the stripping overhead. When the entrance has been extended as far as is deemed safe for the miners, the bank is left until a wet season causes the overhanging clay to fall in. This is then removed and the mining continued as before.

This iron property is historical. Here the first ore was dug and the first iron made west of the Cumberland Mountains. This was done in 1797 by General Robertson. In 1810 Mr. Montgomery Bell came in

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possession, and here were made the cannon balls used by Gen. Jackson in the battle of New Orleans.

The entire property consists of 16,000 acres, about 1,500 of which are cleared and in cultivation. The farm is cultivated in corn, wheat, and hay. Five hundred acres were planted in corn in 1875, which made about 20,000 bushels. In millet there were 150 acres, making 300 tons, and in wheat 200 acres, which yielded ten bushels per acre.

Between twenty-five and thirty hands are kept constantly employed on the farm, who are paid an average for men and women $13 per month and rations. The number of mules on the farm and at the furnace is 150. Several teams are kept employed in hauling pig iron to Betsy's Landing, on the Cumberland river, eight miles distant. When carried by contract, the price is $2 per ton. About one-half of the lands belonging to the property can be cultivated with profit. The valley of Barton's Creek is, in some respects, a beautiful one. The bordering line of hills is more subdued than in other parts of the county, and the landscape is diversified with pleasing alternations of hill and valley. Heavy timber, consisting of oaks principally, cover the tops and slopes of the ridges. Some hickory, ash and poplar (*lyriodendron tulipifera*) are found in the valleys and on the northern slopes of the hills, and a few chestnuts upon the higher ridges. The timber on some of the lands has been cut off twice for making charcoal. About 7,000 acres are now covered with a second growth, nearly all of which will yield 30 cords per acre. The quantity and excellence of the ore, the abundance of timber, the number of perennial streams that enliven the valleys and furnish excellent water powers, the healthfulness of the situation, and the number and convenience of the buildings, all conspire to make this as near a perpetual iron property as any in the State. For three quarters of a century iron has been manufactured here, and there is no reason for believing that it will not be made on the same spot a century hence.

STONE'S BANK.

Three miles and a half south of Bon Aqua Station, on the Northwestern Railroad, this bank is found. Geologically, like all others in the Western iron belt, it occurs in the lithostrotion bed of the lower carboniferous. The fossil coral is everywhere abundant, as well as large beds of chert. The ore lies imbedded in a matrix of clay, much like those already mentioned. It is found in great abundance. It was once worked in a bloomary and made excellent bar iron. Other banks occur near abandoned furnaces, but will be of but little value until the timber reproduces itself.

Worley Furnace also lies near the railroad in the same county, but it is not now in blast. The banks around it furnish rich ores in great quantities. In 1849 there were six furnaces and four forges in operation in the county.

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HICKMAN COUNTY ORES.

It is impossible, within a limited space, to give the reader a correct idea of the immense iron banks of Hickman county. They cover fully one-fourth of the hilly surface of the county, and at some places rise in great ridges two or three hundred feet above the level of the streams. The streams are usually deeply cut; these cuts passing through the Sub-carboniferous, Devonian, Upper Silurian, down to the Nashville series of the Lower Silurian. The iron deposits are found in the siliceous group of the Sub-carboniferous. When deposits are found below the Black Shale, as is sometimes the case, they have been formed from the erosion of outcrops lying above. On the banks of Piney Fork iron ore is found associated in considerable quantities with the Lower Helderburg and Niagara rocks of the Upper Silurian, but it has tumbled down from the precipitous cliffs that overhang the stream. So abundant is the iron debris, that a furnace might be run from it.

At this point, eight miles south of Centreville, is the finest presentation of ore in the Western Iron Belt, if not in the State. Brushy Creek has a general course to the north-east, Piney to the north-west. United, they form the Beaver Dam, a tributary of Duck river. Between Brushy and Piney the country is very elevated, rising probably 300 feet above the bed of the streams. A gorge one mile long and two hundred yards wide lies on the south side of Brushy. On the east side of this gorge and between it and Piney, are the celebrated Ætna Banks, the most extensive that have yet been opened in the State. Here, including the deposits on the western side of the gorge, are three square miles of ore-land with a depth of ore varying from ten to 120 feet. Several extensive excavations have been made and the blocks of ore stand out like the houses of an exhumed city. Many of these blocks would weigh thousands of tons. The blocks are usually made up of a congeries of small puts, or rather they resemble a hardened mass of brown, boiled, porous pitch, with more or less white sparry matter intermingled. The structure is shelly or honeycombed, and the ore very brittle, easily broken in pieces with a hammer. Only the northern end of this vast deposit has been opened, and though many thousand tons of metal have been made from the ore raised at this point, the banks have not been fairly opened. What has been done is a mere pit on the square miles of ore.

The ore is a hydrous oxide, with a less proportion of water than is found in limonite; is of excellent quality, making very superior iron. On the eastern side of Piney Fork the ore extends nearly to the Maury county line, and lies between Swan Creek and Piney Fork on the high ridges.

One mile south-east of Vernon, the old county seat, and north of Duck River, are other banks almost or quite as valuable as the Ætna banks. The ore crops out here in large boulders. The ridge containing this ore extends for one and a half miles, the old Oakland banks

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occupying the eastern extremity. On the west side of these banks there are 30,000 acres of original timber, consisting of black oak mainly, which will yield from 40 to 60 cords per acre, and 75,000 acres of the same character of timber lie on the east.

Some eighteen or twenty other banks, furnishing ore of prime quality, exist in this county. Among the more important are those on Garner's Creek, Mill Creek, Defeated Creek, Haley's Creek, and Jerry's branch. The probable early construction of the Duck River Valley Railroad from Johnsonville to Columbia, extending through this county, will open up this valuable mineral district. It is now land-locked, with no outlet either by water or rail. No place in the United States can offer superior facilities for the manufacture of charcoal iron, when means of transportation shall be provided.

The adjoining county of Humphreys has some good banks of iron ore. One of these lies on Turkey Creek, near the Tennessee river, and is valuable in having an outlet by water to the markets of the world. Some of the ore from these banks in my possession has a handsome and rich appearance, though I have not yet obtained an analysis of it.

WHITE COUNTY ORES.

About three and a half miles a little west of north from Sparta, occurs a line of low hills, running in a north-west direction for several miles, in which a very good quality of brown oxide is found. The surface of the hills is covered with a water-worn gravel of a dirty yellow appearance, intermingled with masses of chert and yellow clay. The ore occurs in lumps of all sizes, often weighing as much as 300 lbs. The hills are conical and about 30 feet above the general surface of the Calf Killer Valley, covering from 1 to 5 acres each and separated from one another by ravines. The deposits extend in a south-easterly direction for about 5 miles. The iron made from this ore is very tough and is especially valuable for making horse-shoes and ploughs. The Board Valley Mountain, lying ten miles north of Sparta, is a well-timbered ridge 500 feet high and 8 miles long, containing iron ore in considerable quantities.

An analysis of an average specimen of White county iron ore, which was compact, with disseminated quartz, gave the result below:

White County Ore.—No. 21.

Water	6.09
Silica	9.31
Iron	48.58
Oxygen combined	20.82
Sulphur	0.10
Phosphorus	0.29

The specimen also contained a sensible quantity of manganese which was not separated.

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ORE OF SEQUATCHEE VALLEY.

This valley is a deep cleft in the Cumberland Table-land, enclosed between the main Table-land on the west and Walden's Ridge on the east. It is a low valley, hollowed out of solid strata of rock which once composed the Table-Land, when Waldon's Ridge and the Western arm were continuous. An anticlinal ridge was here thrown up, which burst on the back, exposing the softer rocks. These softer rocks were eroded, leaving the solid walls rising sheer 1,000 feet, with the original strata, dipping from both sides backward. The valley has an average width of 4 miles, and from Jasper, near the foot of the valley, to its head is 70 miles, overlooked, throughout the entire distance, by bold precipitous cliffs of sandstone. Strata crop out in these cliffs along both sides from the lower beds of the Upper Silurian up through the coal-measures.

Hugging the escarpment on the north-east and south-west are two minor valleys averaging a mile in width. Near the centre of the valley is a series of round hills. Instead of seeking either of the minor valleys on either side, the Sequatchee River winds down among the hills in the centre of the valley. On the south-eastern side of the valley there is a chain of low rounded hills, called knobs, which are singularly rich in beds of fossil ore. Beginning 4½ miles above Jasper, this ore crops out for 60 miles, the stratum varying from two to four feet. Nine miles from Jasper, the outcrop is the largest which I have ever seen of the dyestone seam. The stratum is composed of three ledges, of which the top ledge is limestone adhering to the ore. The stratum dips slightly towards the mountain. The iron ore deposit is cut through by several ravines extending to the foot of Walden's Ridge, on the eastern escarpment of the valley. The ore crops out along the face of Walden's Ridge at the head of these ravines, about 200 feet above the lowest point of the valley. From this point the ore may be said to be continuous for 14 miles. After that the iron ridge is broken in mountain spurs. Iron ore, in the form of nodules, occurs in the ridges near the head of the valley, and in several minor hills near it.

Furnaces could be built in many places along the Sequatchee river, with tramways constructed so as to bring the ore from the south-eastern side and the coal from the north-western side of the valley. The mountain slopes are covered with extensive forests, although timber is not plentiful in the valley. A railroad from Jasper connects with the Nashville & Chattanooga Railroad, and an English company is opening coal banks some ten miles up the valley and constructing a railway to that point.

A specimen of the ore taken from the Mitchell farm where the carbonate of lime was in excess, was analyzed with a view of ascertaining whether it contained iron enough to justify working, which can be done without the addition of any flux. The analysis is given below:

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Sequatchee Valley Ore.—No. 22.

Water	2.54
Silica	5.08
Iron	39.04
Oxygen Combined	16.73
Sulphur	trace.
Phosphorus	5.04

Carbonate of lime—not determined.

BLACK MARBLE.

Blount county has deposits of black marble in sufficient quantities to supply the world. From Abram's Creek, a tributary of the Little Tennessee, for a distance of six miles south-west, this marble is everywhere seen. It rises at places in huge mountains 200 feet or more in height. This marble has a singular beauty. With a black ground it has white reticulated veins of calcite permeating it in every conceivable direction. It bears a fine polish. It may here be mentioned that no State in the Union can equal Tennessee in the beauty and variety of its marble. One hundred and fifty specimens have been collected in the State Museum, all differing in the commingling of colors. From the pure white to the jet black, red, brown, gray, yellow, flesh-colored, variegated,—all these colors and shades are represented.

LITHOGRAPHIC STONE.

In the present state of the lithographic and chromo-lithographic arts, the fine-grained and exceedingly rare stone, suitable for this purpose, is of great importance. The lithographic stone of Bavaria was awarded a premium at Paris in 1865, and that of Solenhofen, Bavaria, is largely imported. Large deposits of this valuable stone are found in McMinn county, Tennessee, which are said to equal the Bavarian. If this be true, it will prove of inestimable value. It lies between two beds of variegated marble. The stratum is thought to run entirely through the county, but some of the stone is too hard for lithographic purposes. The best is found 8 miles east of Athens, on the farm of Robert Cochrane, and a quarry has been opened by a Cincinnati company, which only pays a royalty of $250 per annum. It is sold for nearly the same price as the Bavarian stone. It is a calcareous and argillaceous stone, formed of the finest sediment, of uniform texture, and possesses a pearl grey tint. The best variety of this stone has a conchoidal fracture and is free from spots of all kinds.

Some good-looking specimens have also been sent to me by Dr. Jarnagin from Jefferson county.

COAL.

The coal measures of the Cumberland Table-Land have been extensively treated of in a preceding part of this publication.

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If the railroad which now runs from Cowan, on the Nashville and Chattanooga Railroad, to Sewanee, was extended five or six miles further east, it would open as fine a coal field as exists in the State. Here, as well as at Sewanee, the top of the mountain is cut by numerous ravines or gorges, which expose the coal and make the opening of mines an unimportant matter. Up these ravines tramways or railroads may be built, and the cars taken up almost under the very outcroppings of the coal seams. Thousands of acres lying north and east of Sewanee now await but the hand of industry to tap their rich and well-nigh exhaustless stores of coal. Of all the coal fields none is more accessible or more inviting to the capitalist. Eastward to Dunlap and north through the eastern parts of Grundy, the western parts of Sequatchee and Bledsoe, through the eastern parts of Van Buren and White, there are deposits of coal, that in Pennsylvania would be worth from one hundred to five hundred dollars per acre, that are untouched, unknown and unappreciated. See Report on Little Sequatchee Coal-Field, published by this department.

WHITE COUNTY COAL.

The coal beds of White county are a part of the great fields just mentioned, and are described here because they have been recently visited and explored by the writer in person. The entire eastern part of White county belongs to the coal formation the northern edge of which is scalloped by coves, the spurs of the mountain jutting out like the teeth of a saw. These coves give easy access to the strata of coal which crop out all along the western margin, up which railways may be constructed with comparatively little cost, and sufficiently far beneath the coal seams to allow of easy loading by chutes. Several mines have been opened east of Sparta, supplying excellent grate coal, which burns like a pine knot. Four miles east of Sparta a stratum of coal was measured by the writer four feet in thickness, parted by a seam of cannel coal, which at the outcrop was about one inch in thickness, increasing until at 30 feet it measured from 3½ to 4 inches. This is the Fisk Bank. It belongs to the shale vein of the Lower Coal Measures. The slope here is gradual. The coal a hard block, of semi-lustrous appearance, and will bear transportation well. It leaves a white ash. The underclay is four or more feet in thickness, while overlying the coal is a bluish shale which is but the underclay of a stratum above. The bed of clay underlying the lower stratum rests upon sandstone, which is here about 100 feet thick, with interstratified shales, itself resting on the mountain limestone.

Little's Bank, lying further north, is more extensively worked than any in the county. The drift has been driven in about 70 feet, with no cross-entries. The thickness of the seam at the outcrop is 44 in., which at 70 feet has increased to 4½ feet. Three feet below this seam is another 3½ feet thick, which was worked many years ago and furnished coal equal in quality to the one now worked. Six feet above

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the first mentioned, is another seam 2 feet thick, of a similar character. The three seams at this point will aggregate a thickness of ten feet.

Various other openings have been made, all in the Lower Measures, which fully demonstrate the fact that the whole western escarpment of the Cumberland Table-land in this county has outcrops of coal which, in the aggregate, will measure from 8 to 10 feet. The distance from the extreme southern opening to the one lying farthest north, is 22 miles; while east of Sparta 16 miles, and 12 miles from Little's Bank, coal appears at Scarborough's mills in seams several feet thick. This is the Sewanee seam. This coal is found in a valley-like depression in the mountain and is covered by only about 6 feet of sandy soil. In general terms it may be affirmed that the whole eastern part of White county is underlaid with coal of great variety and excellence, easily worked, and covering in all an area of quite 200 square miles. These same outcrops in the Lower Measures continue south-east into Van Buren county. On Big Hill branch a tributary of Cane Creek, six miles east of Spencer, good lump coal occurs in a seam 6 feet thick. It has been used for 25 years, and is highly esteemed for its welding properties.

Another presentation occurs in the bed of the same branch 200 feet below the top of the mountain. Two miles north-west of this place, on the east side of Cane Creek, Mooney's heirs' Bank is situated, and the seam is five feet thick. This seam is nearly one hundred feet above that last described. On both sides of Cane Creek for 12 miles, coal occurs in workable quantities, and is easily reached. These banks belong to the lower coal measures, all the seams being below the conglomerate, except those on Clift's Creek and at Scarborough's mills. The seams are regular, the coal of good quality, free from slate, with a very small per cent. of sulphur. It burns freely, leaving as a residuum a white ash. A peculiarity of the lower coal measures of this region is noticeable. In Pennsylvania they are called "the barren measures," because the coal seams cannot be relied upon, thinning out in both directions.

In an elaborate article on the subject of coal, prepared for Appleton's Cyclopædia, by S. H. Daddow, this fact is noticed: "The conditions for coal making," says Mr. Daddow, "appear to have existed in the south earlier than farther north; consequently coal is found in rocks which in the north are subcarboniferous and produce no coal."

These seams in White county are continuous, varying but little in thickness and lying almost horizontal. In Marion and Hamilton counties the seams of these measures are liable to variations in thickness. At one point a seam was opened which was 6 feet at the outcrop, increased to 9 feet and fell off to 3, thus showing the lenticular structure of the ore in the lower measures of those counties. In White county, on the contrary, the seams have varied very little, though gradually increasing with the length of the adit.

The following section from Little's Bank will no doubt apply to the

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western margin for several miles. Beginning at the top and descending, we have:

1	Conglomerate covering rock	40 to 60	ft.
2	Shale	75	"
3	Sandstone	12	"
4	Coal	2	"
5	Shale and fire clay	6	"
6	Coal, main entry 44 in. at outcrop,—cubical	4¼	"
7	Fire clay and shale	3	"
8	Coal, worked many years	3½	"
9	Underclay	2	"
10	Shale and sandstone	30	"
11	Mountain limestone.		

This portion of our coal-field in White and Van Buren counties has been little noticed; however, there has been no way of reaching them. There is now a railroad connecting with the Nashville & Chattanooga road, in operation as far as McMinnville and is graded to Sparta. Negotiations are now pending by which it will probably be continued as a regular thoroughfare to the coal and iron regions of White county.

WATER POWER.

The water power of Tennessee is of great importance and must soon, as a means of saving expense of fuel and labor, become a great source of wealth. Before the days of railroads, when all the counties were on an equal footing in regard to the means of transportation, there were profitable manufactories of cotton and woolen goods in many of the counties which possessed these water-power facilities.

Since the establishment of railways, however, most of these counties have been, as it were, out of the commercial world. In some of them railroads are now in process of construction, and soon there will be ample means of transportation for their goods to the commercial marts of the Union. They demand the attention of manufacturers, because, at this time the necessity of cheapness requires the saving of every cent in the cost of manufacturing.

As a general thing the water-power of Tennessee is very valuable in the counties along the Cumberland Table-land, and in those along the Alleghany range. These are the most important counties, and their streams flowing from the mountains, where the rains are frequent and the water-supply regular, are constant in their flow. In East Tennessee the Powell, Clinch, Holston, Watauga, Nolichucky, French Broad, Big Pigeon, Little Pigeon, Little Tennessee, Hiwassee, Ocoe river, with their innumerable tributaries from the peaks of the Blue Ridge, flowing through the gorges and canons among the lofty Unaka, form a water system unsurpassed in any part of the world. East Tennessee is a country of rivulets, creeks and rivers, with their many waters all flowing continuously from the

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mountain peaks of the Unakas to the point where the Tennessee flows into Alabama. In the counties of Carter, Johnson, Washington, Unicoi, Greene, Cocke, Sevier, Polk, Blount, McMinn, and Monroe, the creeks are numerous and constant, their fall sufficient, mill and manufacturing sites abundant, and these counties are either now or soon will be connected with the markets of the world by rail.

Coming to the Cumberland Table-land, we find the streams from even the most eastern edge of that broad plateau flowing westward down the slopes of the Cumberland mountains, foaming and dashing in wild torrents and leaping cascades, down the valleys between the spurs and outliers of the Table-land, and pouring an unceasing water-fall over the rim of the Central Basin; their long white lines of mist and creamy foam, like truce-flags in this centennial year, beckoning the pursuits of peace and the industries of a prospering people who are ready to bind up the rude gaping wounds which war has left. A description of the water power of White county will be fairly representative of this region. The power of this county is sufficient to work up all the cotton raised in the United States. That on Caney Fork, the principal stream if not the best in the county, is at least the most powerful. It is one of the longest tributaries of the Upper Cumberland. Rising on the Cumberland Table-land 12 miles east of Sparta, it descends through a narrow gorge hemmed in by frowning cliffs for 12 or 15 miles, to a point where it debouches into an undulating valley plain, passing on westward by many a winding way through this valley, it plunges at Rock Island, in a succession of falls and rapids extending for 2½ miles, over a siliceous limestone formation.

At Rock Island, where the piers of a railroad bridge have been partly built, there is a fall of five feet, which might be increased by a dam so as to furnish any required force. From the island, continuing about two miles, a descent of five feet is made by the stream. At this point is the principal fall, where the water descends perpendicularly twenty-five feet.

Below the main fall there are rapids with a descent of 6 feet, for a distance of 250 yards. Then there occur three falls within 100 yards of each other, each about 20 feet, and these are followed by rapids for a distance of 30 yards, with a fall of 6 feet. Below the rapids there is eddy water for 150 yards. Beyond this, rapids, with a fall of 6 feet, extend for 100 yards. From this point back a quarter of a mile to the principal falls, the aggregate descent of the stream is 96 feet. Below the last mentioned rapid there is a succession of rapids to the Horse-shoe Falls, where there is a fall of six feet. The current from this point for a distance of two miles is rapid. Four miles below, at Frank's Ferry, is the head of steamboat navigation. At many places the channel is only 20 yards from the bank, widening to 100 yards. The banks and bed of the stream are formed of a hard siliceous limestone, from Rock Island to the foot of the rapids. Dams could easily be constructed of cheap material lying convenient—so durable as to sustain any pressure—beyond the danger of undermining, or destruction

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by diversion of the stream around the ends, and of a capacity sufficient to secure any force that might be desired.

Yet this is not the best nor most available water power. Many streams in White county have nearly equal power and possess better sites for mills and factories. Falling Water is one of these. At one point there is a series of rapids, where the descent is 200 feet in a distance of 700 yards, and the volume of water large enough for any manufacturing purpose. A log pinned down to divert a part of the stream is sufficient dam to furnish 80 horse power for a mill. The stream is remarkably constant, never very low and never too high. A record of fifty years shows no stopping for freshets.

Taylor's creek, a tributary of Falling Waters, supplies excellent power, with a fall of 69 feet in 300 yards, furnishing two mills with ample power within 200 yards. Below the lower dam there are rapids for a distance of 200 yards, then a succession of falls ten, twenty, and one hundred and sixteen feet. The stream has worn a channel in the solid rock 50 feet deep before reaching the main fall, so that the fall is not so high as the bluff by that distance.

The Calf Killer also furnishes fine water power within a half mile of Sparta. At these falls the Sparta Factory was built many years ago, and cotton and woollen goods successfully manufactured. The machinery was shipped south during the late war, and has never been replaced. There was a dam of 15 feet at the falls, which gave a head of 22 feet at the factory. The height of this dam could, with advantage, be increased 10 feet. This is a representative county, as before remarked, of those lying along the Table-land. All the counties bordering on the basin are well supplied with water power. Lawrence county, in this respect, is not excelled by any in the State, and numerous manufacturing est[illegible] already in successful operation on Shoal Creek and [illegible] cotton and woollen goods.

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